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A NATIONAL TECHNICAL SERVICES COMPANY

DOT 0284

REPORT NOS. 212-AETL-80-013-971-3882-26
219-AETL-80-013-971-3882-26
301-AETL-80-026-971-3882-26

NEW VEHICLE ASSESSMENT AND STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS NOS. 212, 219, AND 301-75

FUJI HEAVY INDUSTRIES LTD.
1980 SUBARU DL1600 - 4WD - 4 DOOR STATION WAGON
NHTSA 801305

APPROVED ENGINEERING TEST LABORATORIES
1536 EAST VALENCIA DRIVE
FULLERTON, CALIFORNIA 92631

DECEMBER 1980

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
- ENFORCEMENT -
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET S. W.
WASHINGTON, D. C. 20590

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Approved by S. J. Valenzuela

Date 12 December 1980

Report Accepted by:

Robert Krauss
Contract Technical Manager
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16. Abstract

New Vehicle Assessment and Standards Enforcement Indicant Test to the requirement of FMVSS 212, 219, and 301-75 on a 1980 Subaru DL1600 - 4WD - 4 Door Station Wagon, NHTSA 801305, VIN-JF24AM31FAG703947 was conducted at Approved Engineering Test Laboratories test facility in Fullerton, California.

The average vehicle impact speed was 34.855 mph in the frontal (0°) mode. Test date was November 24, 1980, and the ambient temperature was 65°F.

The subject test vehicle appears to comply with all the requirements of FMVSS 219 and 301-75, but does not appear to comply with all the requirements of FMVSS 212.

The driver dummy experienced a HIC value of 1269 and the passenger dummy a HIC value of 2286; driver dummy chest resultant of 62.5g; all are in excess of the limits specified in FMVSS 208. All other values satisfy FMVSS 208.

17. Key Words	18. Distribution Statement
New Vehicle Assessment FMVSS 212 - Windshield Mounting FMVSS 219 - Windshield Zone Intrusion FMVSS 301-75 - Fuel System Integrity	

19. Security Class. (of this report)	20. Security Class. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	150	

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SECTION 1

1.0 INTRODUCTION

This report contains information regarding a joint program for the Office of Vehicle Safety Compliance (OVSC), Office of Automotive Ratings (OAR), and Research and Development (R&D), for a vehicle assessment and standards enforcement indicant tests of windshield mounting, windshield zone intrusion, and fuel system integrity relative to Federal Motor Vehicle Safety Standard (FMVSS) No's. 212, 219 and 301-75. This test was performed under Contract Number DOT-HS-9-02273 by Approved Engineering Test Laboratories, 1536 East Valencia Drive, Fullerton, California, in accordance with the Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures (TP212-02).

The specific purpose of this test was to obtain research and vehicle rating data in conjunction with windshield mounting, windshield zone intrusion, and fuel system integrity indicant data, when a vehicle is impacted in excess of the velocity (30 mph) requirement of FMVSS 212, 219, and 301-75.

Section 2 contains general test and vehicle information, occupant/vehicle acceleration summary data, while Section 3 contains all compliance related data. Section 4 contains test dummy and vehicle measurements, along with camera positions. Section 5 discusses AETL's test facilities and data acquisition and reduction system. Appendix A contains additional

photographs not related to vehicle compliance. Appendix B contains the computer-generated plots, while Appendix C contains the dummy certification reports if applicable.

1.1 ADMINISTRATIVE DATA

A. References

1. Federal Motor Vehicle Safety Standard No. 212 "Windshield Mounting" as published in the Federal Register, Volume 41, No. 36493, dated 30 August 1976.

2. Federal Motor Vehicle Safety Standard No. 219 "Windshield Zone Intrusion" as published in the Federal Register, Volume 40, No. 25462, dated 16 June 1975.

3. Federal Motor Vehicle Safety Standard No. 301-75 "Fuel System Integrity" as published in the Federal Register, Volume 38, No. 22397, dated 20 August 1973.

4. National Highway Traffic Safety Administration - Office of Vehicle Safety Compliance Laboratory Procedures for Vehicle Assessment and Standards Enforcement Indicant Testing for "Windshield Mounting", FMVSS 212 - "Windshield Zone Intrusion", FMVSS 219 - "Fuel System Integrity", FMVSS 301-75, TP 212-02, dated April 1, 1980.

SECTION 1

B. Description of Test Vehicle

1. 1980 Subaru DL1600 - 4WD - 4 Door Station Wagon
2. Vehicle Identification No.: JF24AM31FAG703947
3. NHTSA No.: 801305
4. Manufactured Date: September 1979
5. GVWR: 3,350 pounds

C. Dates

1. Vehicle Received: May 25, 1980
2. Start of Test: September 9, 1980
3. Completion of Test: November 24, 1980

SECTION 2

SECTION 2

2.0 GENERAL TEST INFORMATION AND SUMMARY DATA

The 1980 Subaru DL1600 - 4WD - 4 Door Station Wagon was subjected to a frontal fixed barrier impact and a static rollover maneuver as required by Federal Motor Vehicle Safety Standards Nos. 212/219/301-75.

Two (2) Part 572 test dummies were positioned in each front designated outboard seating position and were restrained by the belt system in the test vehicle. Just prior to the impact event, the driver dummy head was painted with red chalk and his knees were painted with yellow chalk. The passenger dummy head was painted with blue chalk and his knees were painted with white chalk to provide post-impact visual inspection of possible dummy head and knee contact with the interior components during the impact event.

TABLE I

SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION:

Manufacturer: Fuji Heavy Industries LTD.

Make/Model: Subaru DL1600 - 4WD

Body Style: 4 Door Station Wagon Model Year: 1980

VIN: JF24AM31FAG703947 Build Date: September 1979

NHTSA No.: 801305 Color: Brown

Engine Data: Four (4) Cylinders; 91.0 Cu. In. Displ.

Transmission Data: Four (4) Speed (X) Manual ( ) Automatic

Major Options: None

VEHICLE ATTITUDE:

Delivered Attitude: LF 26.3 in.; RF 26.0 in.; LR 27.7 in.; RR 27.5 in.

Test Attitude: LF 25.8 in.; RF 25.4 in.; LR 25.7 in.; RR 25.2 in.

VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 26 psi

(Up to Vehicle Load Capacity) Rear = 32 psi

Recommended Tire Size: 175/70SR13 Load Range: unknown

Tires on Vehicle: 175/70SR13 - Bridgestone

Spare Tire: X Yes; No; Space Saver: Yes; X No

TABLE Ia

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS:

Date of Test: November 24, 1980 Time of Test: 1545

Ambient Temperature: 65 °F at Impact Area

VEHICLE CAPACITY:

Type of Seats: ____ Bench; X Bucket; ____ Split Bench

Designated Seating Capacity: Front 2
Center 0
Rear 2
Total 4

Cargo: unknown lbs.

Total unknown lbs. (Vehicle Capacity Weight)

GVWR: 3,350 lbs. (Taken From Certification Label)

GAWR: Front 1,700 lbs.; Rear 1,650 lbs.

VEHICLE DELIVERED WEIGHT: (Fuel - 93% of NFC)

Left Front 644 lbs. Left Rear 512 lbs.
Right Front 697 lbs. Right Rear 481 lbs.
Total Front Weight 1,341 lbs. (57.5 % of Total Vehicle Weight)
Total Rear Weight 993 lbs. (42.5 % of Total Vehicle Weight)
Total Delivered Weight 2,334 lbs.

CALCULATED VEHICLE TEST WEIGHT: 2,962 lbs.
(With Required Dummies and 300 lbs. Cargo)

ACTUAL VEHICLE TEST WEIGHT:

Left Front 726 lbs. Left Rear 740 lbs.
Right Front 775 lbs. Right Rear 706 lbs.
Total Front Weight 1,501 lbs. (50.9 % of Total Vehicle Weight)
Total Rear Weight 1,446 lbs. (49.1 % of Total Vehicle Weight)
Total Test Weight 2,947 lbs.

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST FLUID DATA:

Test Fluid Type: Red Stoddard Solvent ; Specific Gravity: 0.764

Kinematic Viscosity: 1.31

Nominal Fuel Capacity: 11.90 gals. (NFC)

Test Volume: 11.07 gals. (92-94% of NFC)

Fuel System Capacity: 11.90 gals.
(Data from Owner's Manual)

Electric Fuel Pump: ____ Yes; X No; Fuel Injection: ____ Yes; X No

Does Electric Fuel Pump Operate with Ignition Switch "On"

And the Engine Not Operating: ____ Yes; ____ No; X N/A

Details of Fuel System: Fuel filler located on right rear fender above wheel opening recessed behind a hinged door, fuel tank located horizontally between frame side rails under cargo floor pan and above rear transfer case.

VEHICLE TEST CONDITIONS:

Temperature in Occupant Compartment: 67 °F

Temperature of Windshield Glazing/Moulding: 67 °F

VEHICLE CRUSH AND REBOUND:

Overall Length of Test Vehicle: Pre-Test - Left 162.7 in.; Right 162.5 in.

Post-Test - Left 138.9 in.; Right 139.4 in.

Crush: Left 23.8 in.; Right 23.1 in.

Rebound (From Rigid Barrier Only): 11.0 in.

POST IMPACT SUMMARY

Vehicle 1980 Subaru DL1600 - 4WD

NHTSA No. 801305 Test Date November 24, 1980

TYPE OF TEST: [XX] 0° Frontal Impact

[ ] 30° Oblique Impact (Driver/Passenger) Side

[ ] Rear Impact

REQUIRED IMPACT VELOCITY RANGE: 34.5 to 35.5 mph

IMPACT VELOCITY: (Traps within 5 feet of impact event)

Trap 1 = 34.86 mph

Trap 2 = 34.85 mph

Average 34.855 mph

Actual distance from vehicle front bumper to barrier face when entering timing trap 57.7 in.

Actual distance from vehicle front bumper to barrier face when exiting timing trap 33.7 in.

VEHICLE STATIC CRUSH: Driver's Side = 23.8 inches

Passenger's Side = 23.1 inches

Average = 23.45 inches

Crush Details: Windshield cracked and partial retention loss, roof buckled over both "A" and "B" posts, frame rails buckled under front doors, driver dummy impacted steering wheel and dash assembly, passenger dummy impacted dash assembly.

VEHICLE REBOUND: (From rigid barrier only)

Driver's Side = 11.0 inches

Passenger's Side = 11.0 inches

Average = 11.0 inches

SECTION 3

SECTION 3

3.0 TEST DATA

The 1980 Subaru DL1600 - 4WD - 4 Door Station Wagon was subjected to a frontal fixed barrier impact and a static rollover maneuver as required by Federal Motor Vehicle Safety Standard Nos. 212/219/301-75.

Color motion picture coverage of the impact along with the static rollover test are considered part of the accumulated pertinent data. Where applicable still photographs are presented in this report; while the motion picture coverage is submitted separately.

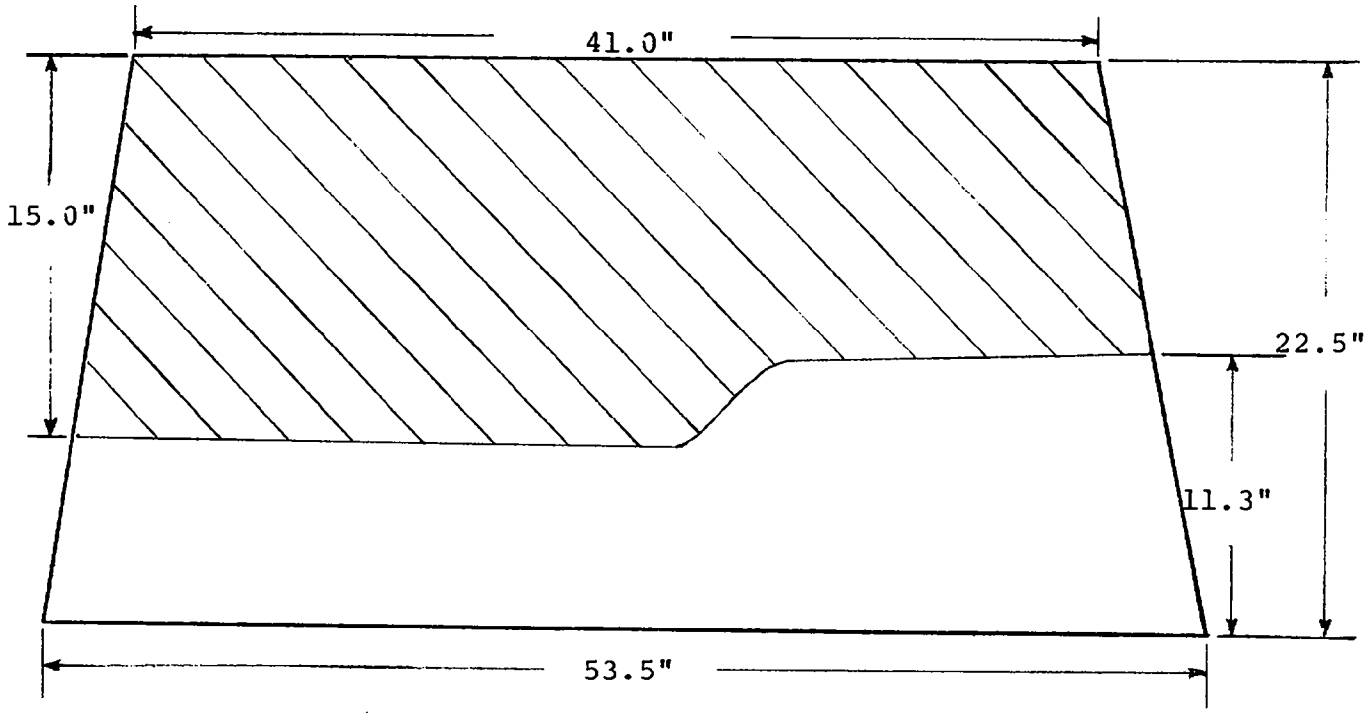
TABLE II

SUMMARY OF TEST CONDITIONS - FMVSS 219

Vehicle 1980 Subaru DL1600 - 4WD

NHTSA No. 801305 Test Date November 24, 1980

PROTECTED AREA



FRONT VIEW OF WINDSHIELD

Provide all dimensions necessary to reproduce the protected zone.

Method of adhering styrofoam to the windshield

Panel and Foam Adhesive

Details of Special Windshield Retention Clips (If Applicable)

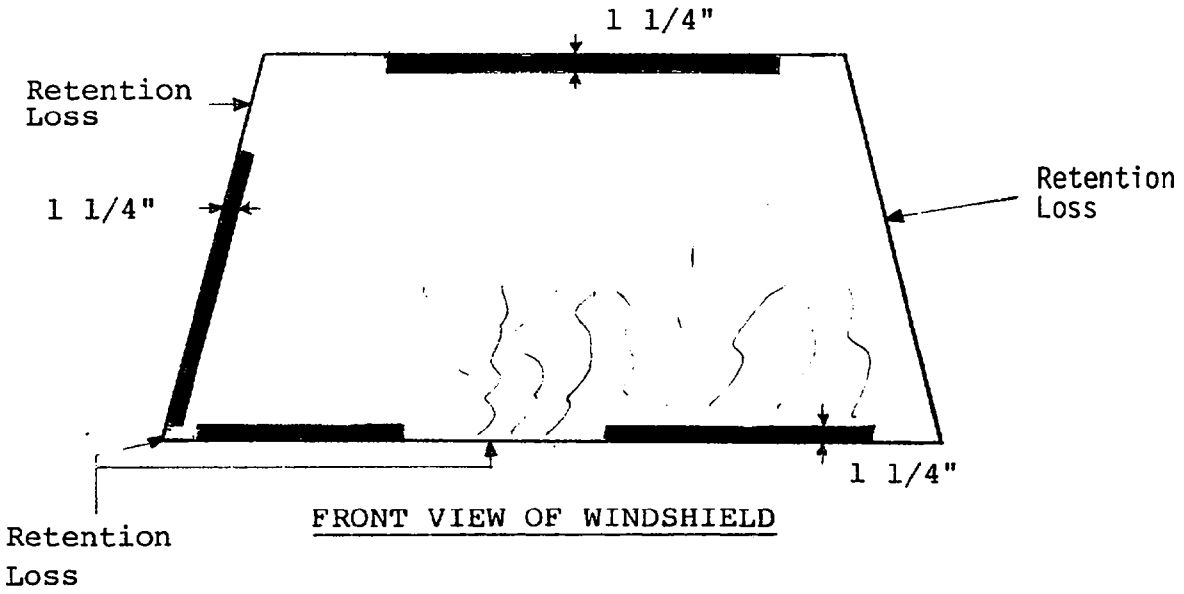
Not Applicable

POST IMPACT SUMMARY

WINDSHIELD RETENTION - FMVSS 212

Vehicle 1980 Subaru DL1600 - 4WD

NHTSA No. 801305 Test Date November 24, 1980



FRONT VIEW OF WINDSHIELD

	Windshield Periphery	
	Pre Test	Post Test
Left Side	71.5 in.	34.0 in.
Right Side	73.4 in.	46.2 in.
Total	144.9 in.	80.2 in.

Type of Occupant Restraints: Combination Lap/Shoulder Belt

Windshield Retention:	Actual	Min. Allow
Left Side	47.6	75.0 percent
Right Side	62.9	75.0 percent
Total	55.25	75.0 percent

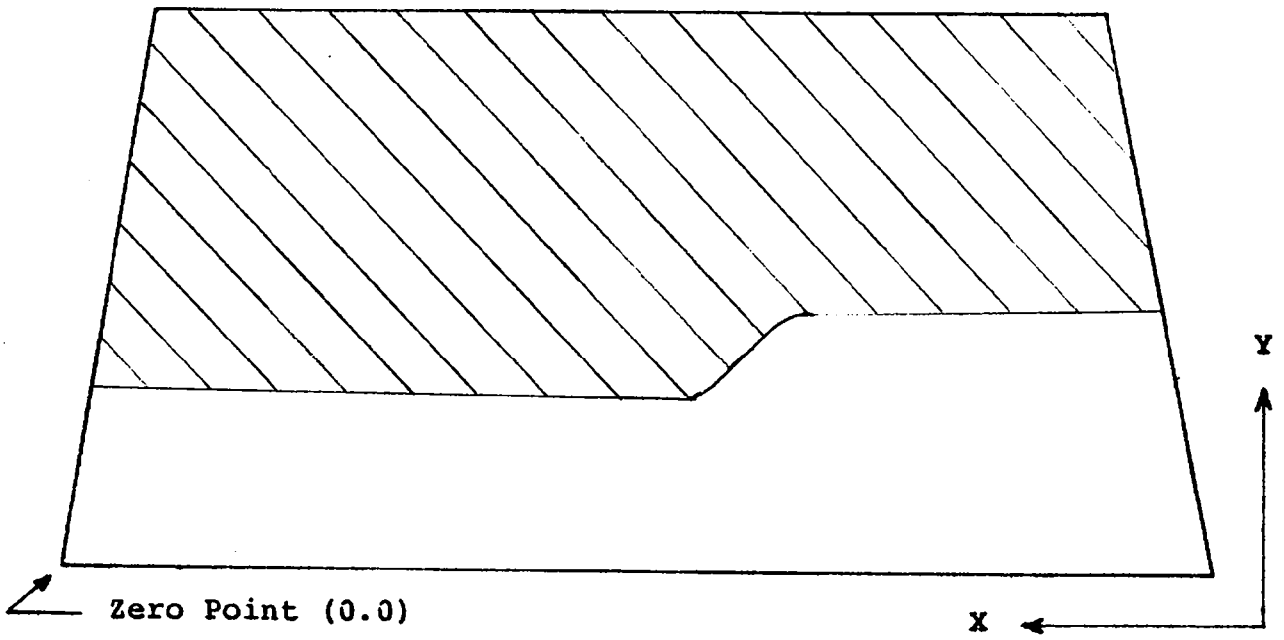
Details of Windshield Mounting: A rubber moulding w/chrome expander encompasses the windshield glass, apparent adhesive is used between moulding and glass and between moulding and body opening.

POST IMPACT SUMMARY

WINDSHIELD ZONE INTRUSION - FMVSS 219

Vehicle 1980 Subaru DL1600 - 4WD

NHTSA No. 801305 Test Date November 24, 1980



FRONT VIEW OF WINDSHIELD

(A) The area that the "Protected Zone" template was penetrated more than 0.25 inches by a vehicle component other than one which is normally in contact with the windshield

Not Applicable

Coordinates

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

(B) The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

Not Applicable

Coordinates

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

TABLE VI

POST IMPACT SUMMARY

FUEL SYSTEM INTEGRITY - FMVSS 301-75

Vehicle 1980 Subaru DL1600 - 4WD

NHTSA No. 801305 Test Date November 24, 1980

	Actual	Max. Allow.
Fuel spillage from impact until vehicle motion ceases.	- 0 -	1 ounce
Fuel spillage for 5 minute period following cessation of vehicle motion after impact.	- 0 -	5 ounces
Fuel spillage for next 25 minute period.	- 0 -	1 ounce/ 1 minute
Time duration from impact until start of rollover test periods.	47 min. 30 sec.	30 minutes

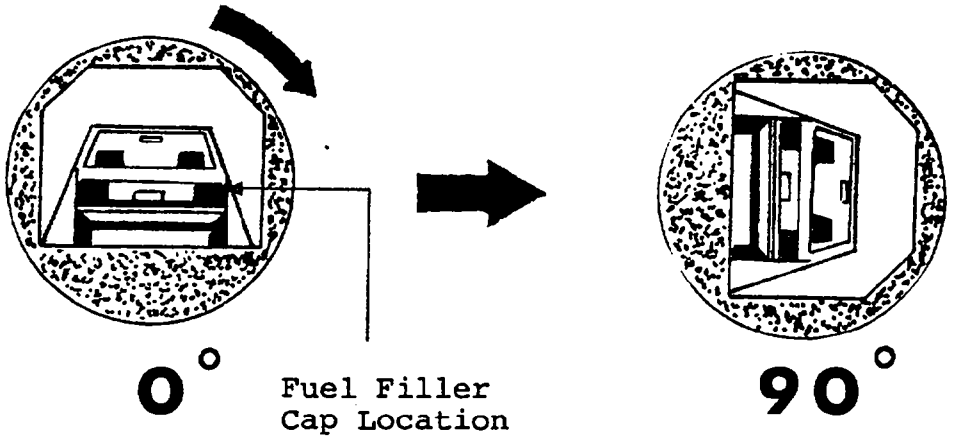
Fuel Spillage Location: Not Applicable

TABLE VII

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1980 Subaru DL1600 - 4WD NHTSA No. 801305



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 10 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	immeasureable	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

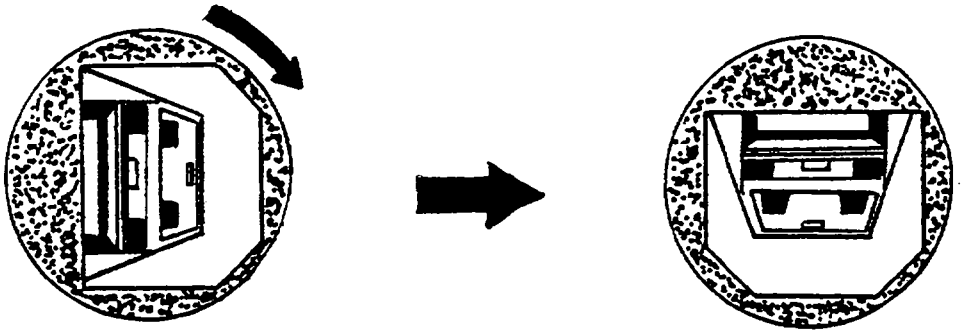
Fuel Spillage Location: Carburetor/Air Cleaner Assembly Area

TABLE VIII

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1980 Subaru DL1600 - 4WD NHTSA No. 801305



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 13 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

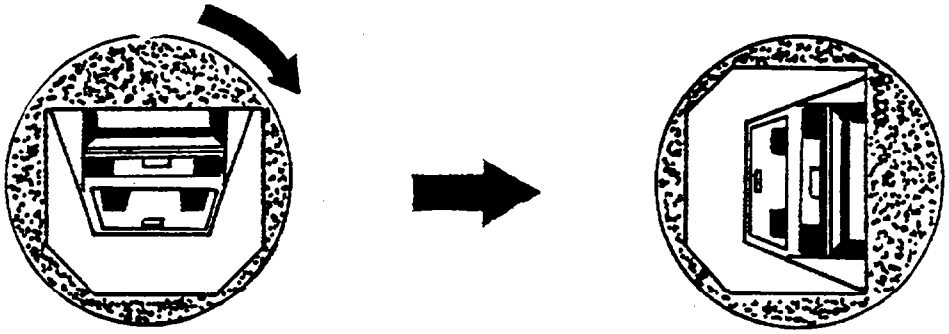
Fuel Spillage Location: Not Applicable

TABLE IX

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1980 Subaru DL1600 - 4WD NHTSA No. 801305



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 18 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

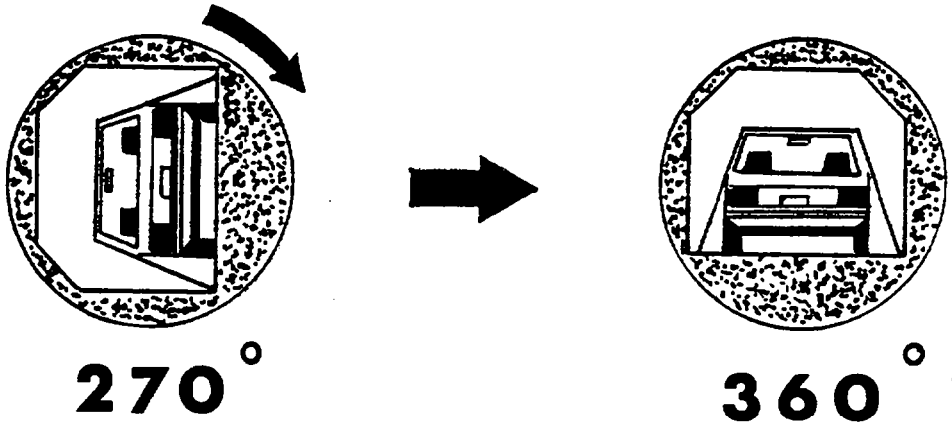
Fuel Spillage Location: Not Applicable

TABLE X

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1980 Subaru DL1600 - 4WD NHTSA No. 801305



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 15 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

Fuel Spillage Location: Not Applicable

SECTION 3

3.1 TEST RESULTS AND PHOTOGRAPHS

Post-impact inspection of the test vehicle revealed almost all crush occurred forward of the rear doors. The roof buckled over both left and right "A" and "B" posts. The left "A" post upper weld (roof) was partially broke. The frame buckled under each front door and the front passenger compartment floor pan buckled. All four doors were jammed and the test dummies were removed thru the rear door. The driver dummy head made contact with the steering wheel assembly and both knees impacted the dash assembly. The passenger dummy head and both knees impacted the dash assembly.

The windshield assembly revealed a retention loss following the impact event. The retention loss consisted of two different loss modes. Partial loss was due to windshield glass and rubber moulding separation and the other from rubber moulding to body opening separation. The rubber moulding to body opening retention loss was predominate. Total separation was observed along the left "A" post and right upper "A" post/roof area. The windshield had numerous cracks developed by apparent cowl/

body deformation and possible contact by the hood assembly. A rubber moulding, with a chrome expander, encompassess the windshield glass. Apparent adhesive is used between the rubber moulding and windshield glass and also between the rubber moulding and body opening.

No windshield zone intrusion was recorded following the test vehicle impact. Part of the styrofoam template broke off during the impact event due to the apparent windshield area deformation. The remaining protected windshield zone area did not appear to have been contacted by an object sufficiently to penetrate the styrofoam outer surface. The unprotected windshield zone area was not penetrated by an object, although the windshield experienced retention loss and numerous cracks developed by apparent cowl/body deformation and possible contact by the hood assembly.

No fuel spillage was recorded following the test vehicle impact, nor during the time period before the start of the rollover test. No fuel spillage was recorded during the rollover test increment time periods.

The 1980 Subaru DL1600 - 4WD - 4 Door Station Wagon test vehicle does not appear to comply with all the requirements of FMVSS 212, but does appear to comply with all the requirements of FMVSS 219 and 301-75.

Figure 3-1

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Pre-Test, Windshield View


80130S

Figure 3-2

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Pre-Test, Windshield Template View


NHTSA
801305

Figure 3-3

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Pre-Test, Full Front View


NHTSA
FMVSS
AETL
26
301

Figure 3-4

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Pre-Test, Left Side View


AETL
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NHTSA 801305
FMVSS 212 219
301

Figure 3-5

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Pre-Test, Right Side View


NHTSA 801305
FMVSS 212 219
301

Figure 3-6

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Left Side View


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FMVSS 212 219
301

Figure 3-7

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Right Side View


NHTSA 801305
FMVSS 412 21
30

Figure 3-8

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Windshield Retention Loss, Left Side View

Figure 3-9

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Windshield Retention Loss, Right Side View


NHTSA
FMVSS

Figure 3-10

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Windshield Retention Loss, Right Side View

Figure 3-11

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Rollover Test, 90° Increment

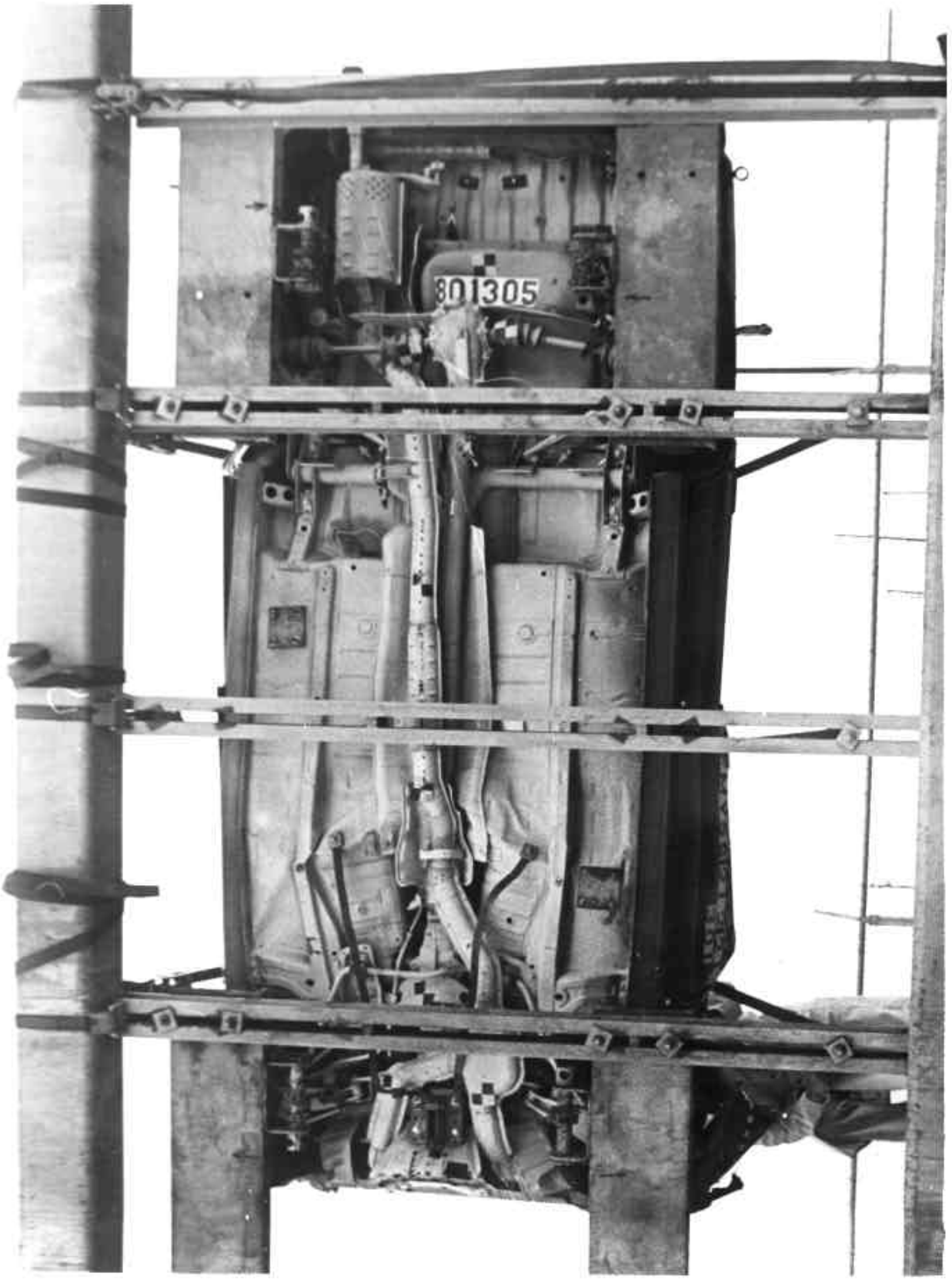
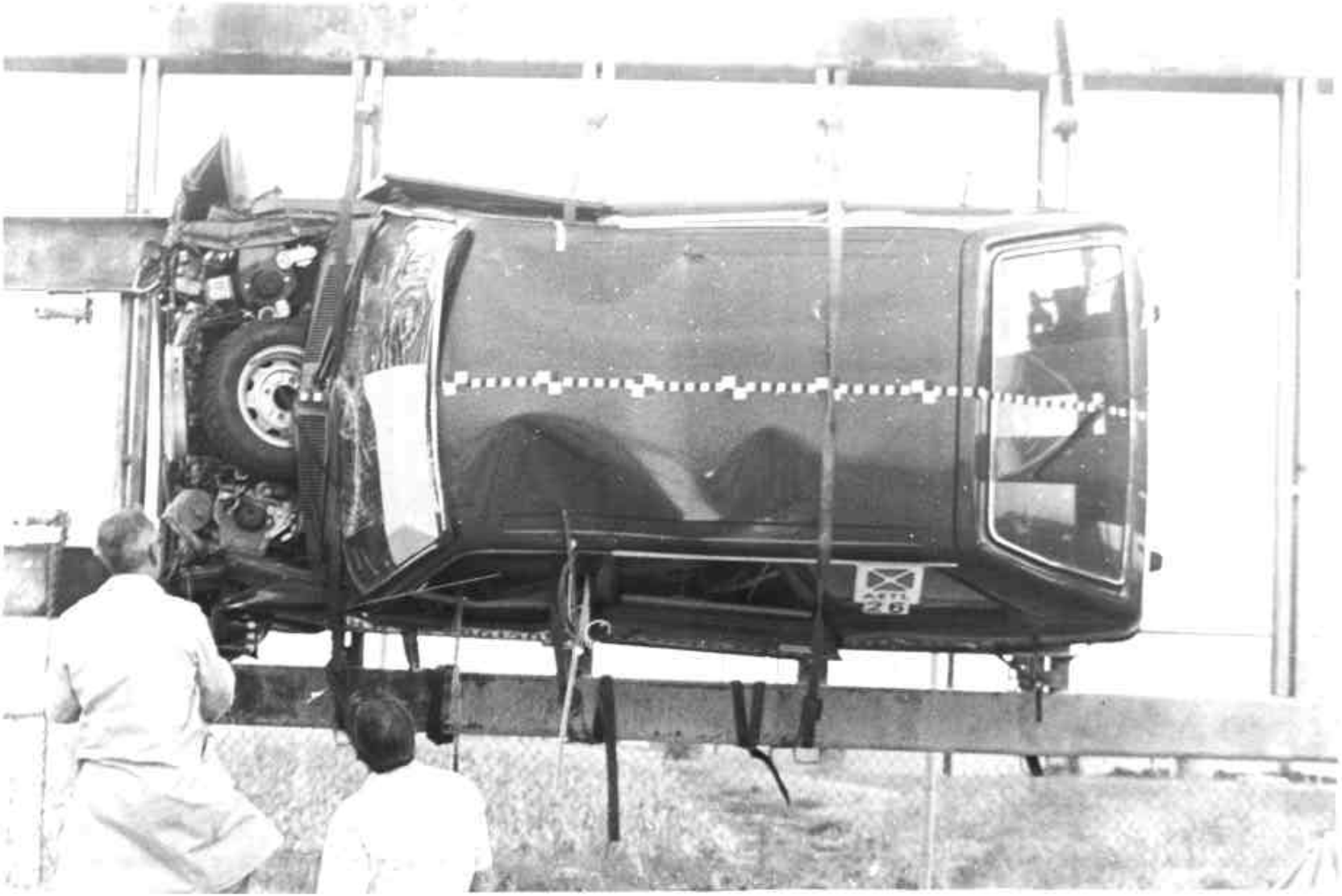

801305

Figure 3-12

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Rollover Test, 270° Increment



SECTION 4

SECTION 4

4.0 OCCUPANT RESPONSE AND VEHICLE ACCELERATION SUMMARY DATA

The following data sheets summarize:

A. The Dummy Position Data (Part 572 Dummy In-Vehicle Position/Part 572 Dummy Pre-Test Clearence Distances Sheets)

B. The Occupant Response Data (Part 572 Dummy Data Sheet)

C. The Vehicle Acceleration Data (Vehicle Structural Data Sheet)

D. The Pre and Post-Test Vehicle Dimensions Data (Vehicle Measurement Data Sheet)

More comprehensive data is presented in Appendix B in the form of computer-generated plots.

SECTION 4

The driver dummy experienced a HIC value of 1269 and the passenger dummy experienced a HIC value of 2286, both in excess of the limit specified in FMVSS 208 injury criteria. The driver dummy experienced a chest resultant three millisecond clip of 62.5 g's, also in excess of the limit specified in FMVSS 208. All other values for both test dummies satisfy the FMVSS 208 requirements.

In addition to the occupant and vehicle data, each shoulder belt was marked at the D-ring after dummy positioning to provide a static measurement of belt position after the impact event. Post-impact measurement of the driver shoulder belt was 3.0 inch and the passenger shoulder belt was 3.0 inch.

TABLE 4-1

PART 572 DUMMY IN-VEHICLE POSITION

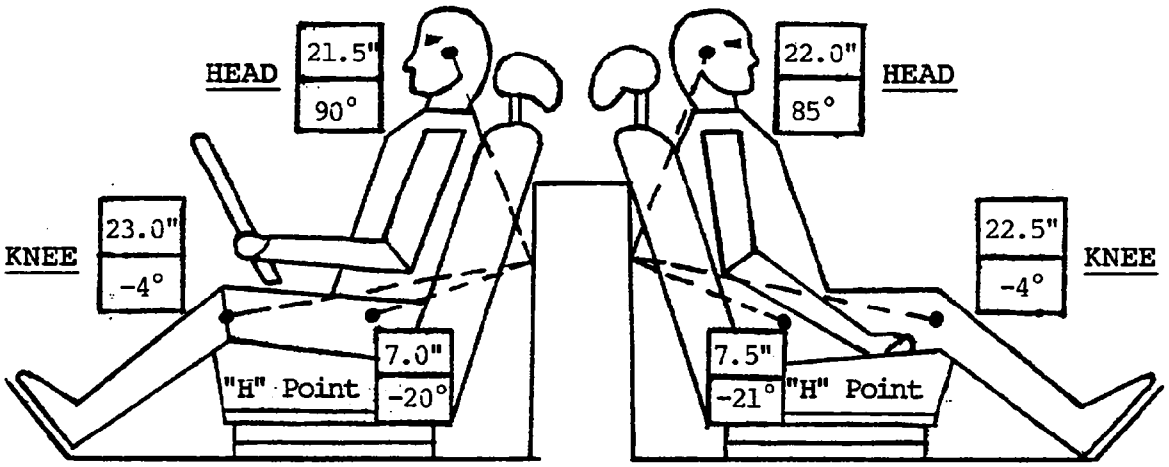
VEHICLE 1980 Subaru DL1600 - 4WD NHTSA NO. 801305

POSITIONING DATE: Nov. 24, 1980 AMBIENT TEMP: 67 °F TIME 1350

SEAT TYPE: ____Bench
__X__ Bucket
____Split Bench

ADJUSTER TYPE: __X__ Manual
____Power

BUCKET SEAT BACK TYPE: ____Fixed
__X__ Adjustable Reclining



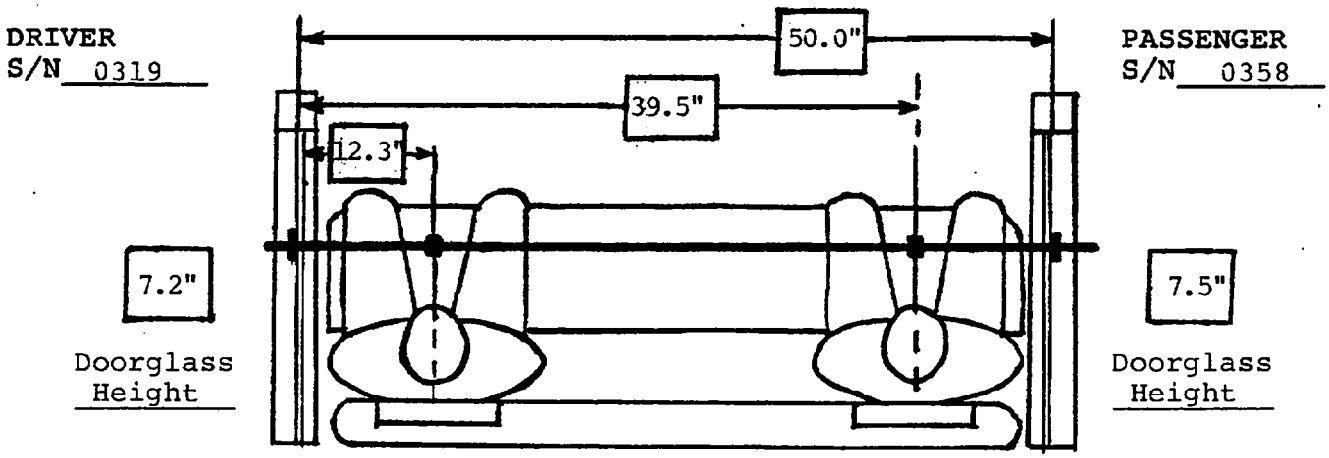


TABLE 4-2

PART 572 DUMMY PRE-TEST CLEARANCE DISTANCES

DRIVER

HH = 13.2 in.

HW = 18.7 in.

HR = 5.3 in.

HS = 7.8 in.

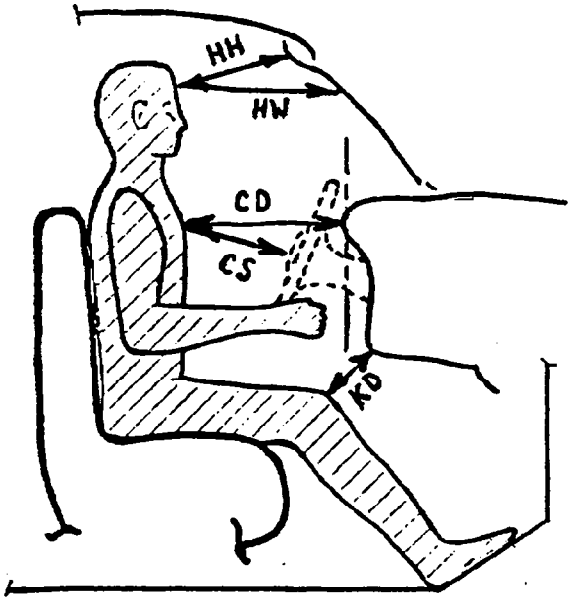
CD = 20.0 in.

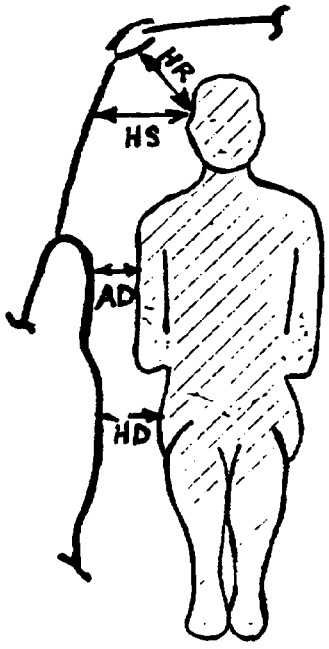
CS = 12.0 in.

AD = 3.0 in.

HD = 6.0 in.

KD = 3.8 in.





PASSENGER

HH = 12.2 in.

HW = 17.0 in.

HR = 4.0 in.

HS = 6.5 in.

CD = 18.5 in.

AD = 3.0 in.

HD = 7.4 in.

KD = 5.5 in.

TABLE 4-3

MANUFACTURERS SEAT BELT INSTRUCTIONS

3. SAFETY SEAT BELTS

FRONT SEAT BELTS

Your car is equipped with a seat belt warning device at the driver's seat in accordance with current safety standards. This device is designed so that the seat-belt warning light on the instrument panel will glow for about six seconds when the driver has turned the ignition-starter switch to "ON".

If the driver has not fastened his seat belt, the warning buzzer will sound at the same time.

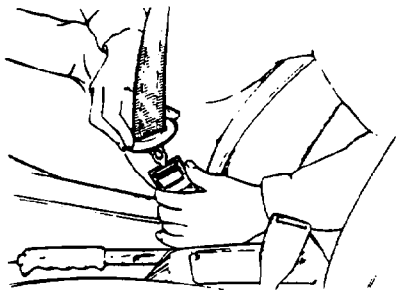
Make it a rule to have all the passengers including the driver fasten their seat belts before starting the car.

The front seat belts are a three-point type with an emergency locking retractor.

During a quick deceleration as the car stops abruptly, turns sharply, or hits another object in an accident, the seat belt retractor is activated to lock the belts.

To fasten the front seat belt, insert the tongue into the buckle until it snaps.

NOTE:
The belts should not be twisted or reversed.



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To disconnect the belt, push the button of the buckle.

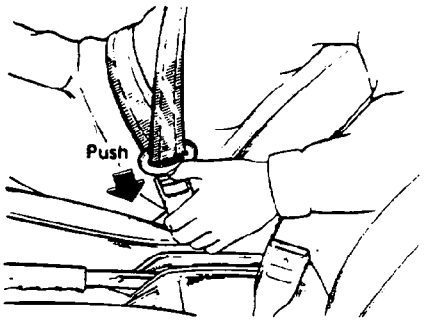

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TABLE 4-4

PART 572 DUMMY DATA

Vehicle 1980 Subaru DL1600 - 4WD NHTSA No. 801305

Driver S/N 0319 Passenger S/N 0358	DRIVER				PASSENGER			
	Positive* Direction		Negative* Direction		Positive* Direction		Negative* Direction	
	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)
HEAD ACCELERATION								
Longitudinal	15.0	113.4	193.4	43.4	19.0	174.0	193.8	80.8
Lateral	23.5	43.6	54.4	73.6	29.1	82.4	9.4	204.4
Vertical	26.8	55.2	69.1	59.0	14.9	172.0	111.7	81.0
Resultant	195.6	43.4			221.6	80.8		
HIC	1269 (43 - 82 msec)				2286 (80 - 89 msec)			
CHEST ACCELERATION								
Longitudinal	7.9	164.6	71.2	53.6	15.6	188.8	57.6	87.2
Lateral	13.0	50.6	16.7	65.2	11.1	72.2	11.4	187.2
Vertical	9.6	93.6	16.5	53.0	9.4	124.8	20.6	85.4
Resultant	73.3	53.4			60.4	86.6		
CSI	729 (62.5g - 3 msec clip)				576 (58.3g - 3 msec clip)			
	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)
FEMUR LOAD								
Left	164	68.2	356	51.0	157	111.2	436	53.2
Right	93	78.4	898	50.4	327	202.8	475	52.0
BELT LOAD								
Torso	1068	78.6			1331	87.6		
Lap	1235	64.4			1105	71.0		

Average Vehicle Impact Speed 34.86 mph

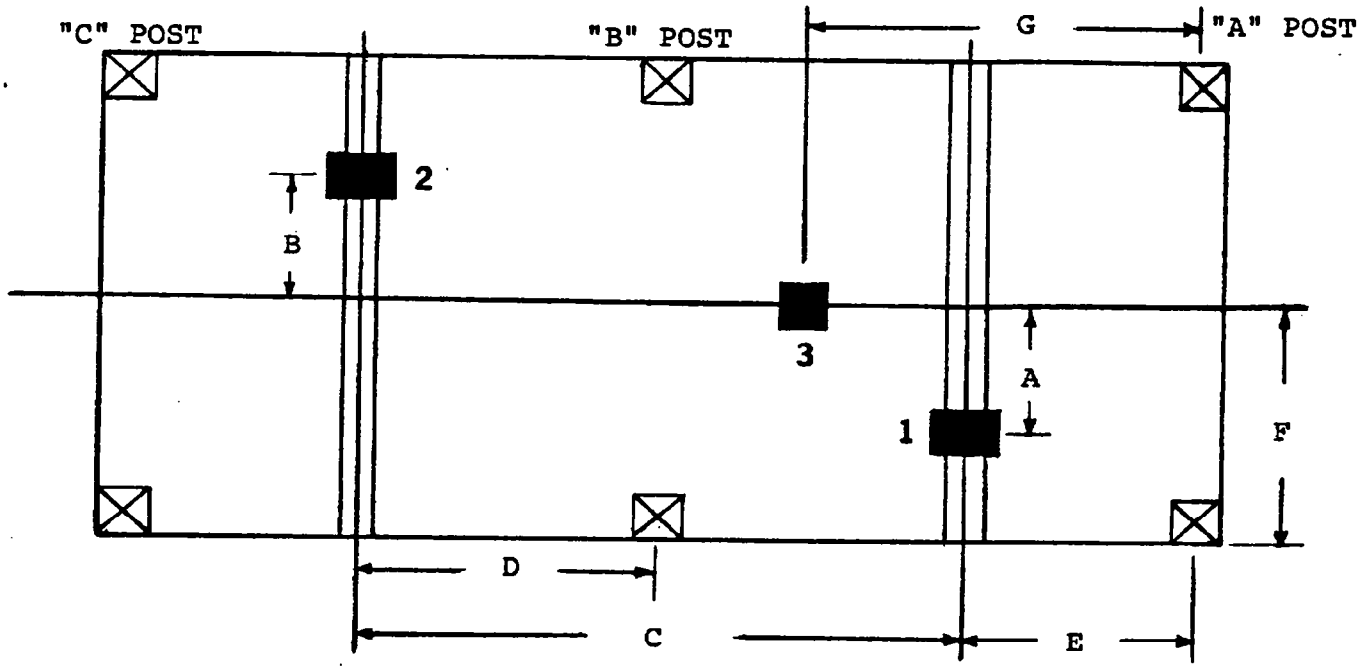
*Positive Direction - Longitudinal: Forward
Lateral: Leftward
Vertical: Upward
Femur: Tension

*Negative Direction - Longitudinal: Rearward
Lateral: Rightward
Vertical: Downward
Femur: Compression

TABLE 4-5

VEHICLE STRUCTURAL DATA

VEHICLE 1980 Subaru DL1600 - 4WD NHTSA NO. 801305



DIMENSIONS			
LOCATION	MEASUREMENT (IN.)	LOCATION	MEASUREMENT (IN.)
A	20.5	E	10.5
B	20.0	F	31.9
C	31.5	G	30.5
D	27.5		

ACCELERATION PEAKS				
ACCELEROMETER LOCATION	POSITIVE* DIRECTION		NEGATIVE* DIRECTION	
	PEAK "G"	TIME (MSEC)	PEAK "G"	TIME (MSEC)
NO. 1 LONGITUDINAL	13.2	18.8	57.9	34.4
NO. 2 LONGITUDINAL	2.4	154.8	44.7	34.4
NO. 3 LONGITUDINAL	38.6	18.2	63.7	12.8

*POSITIVE - LONGITUDINAL: FORWARD DIRECTION

*NEGATIVE - LONGITUDINAL: REARWARD DIRECTION

TABLE 4-6

PRE-TEST

VEHICLE MEASUREMENT DATA

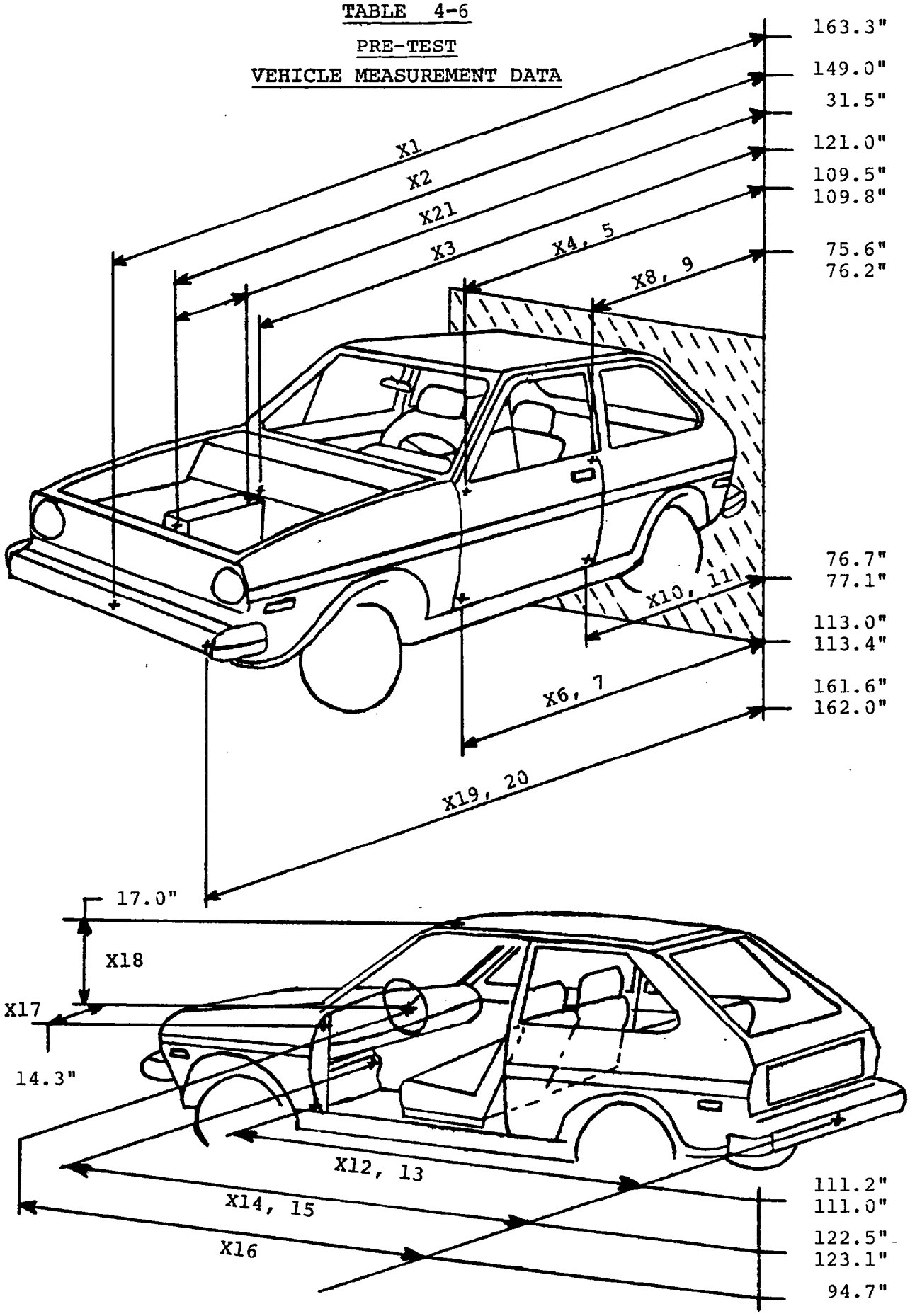


TABLE 4-7

POST-TEST

VEHICLE MEASUREMENT DATA

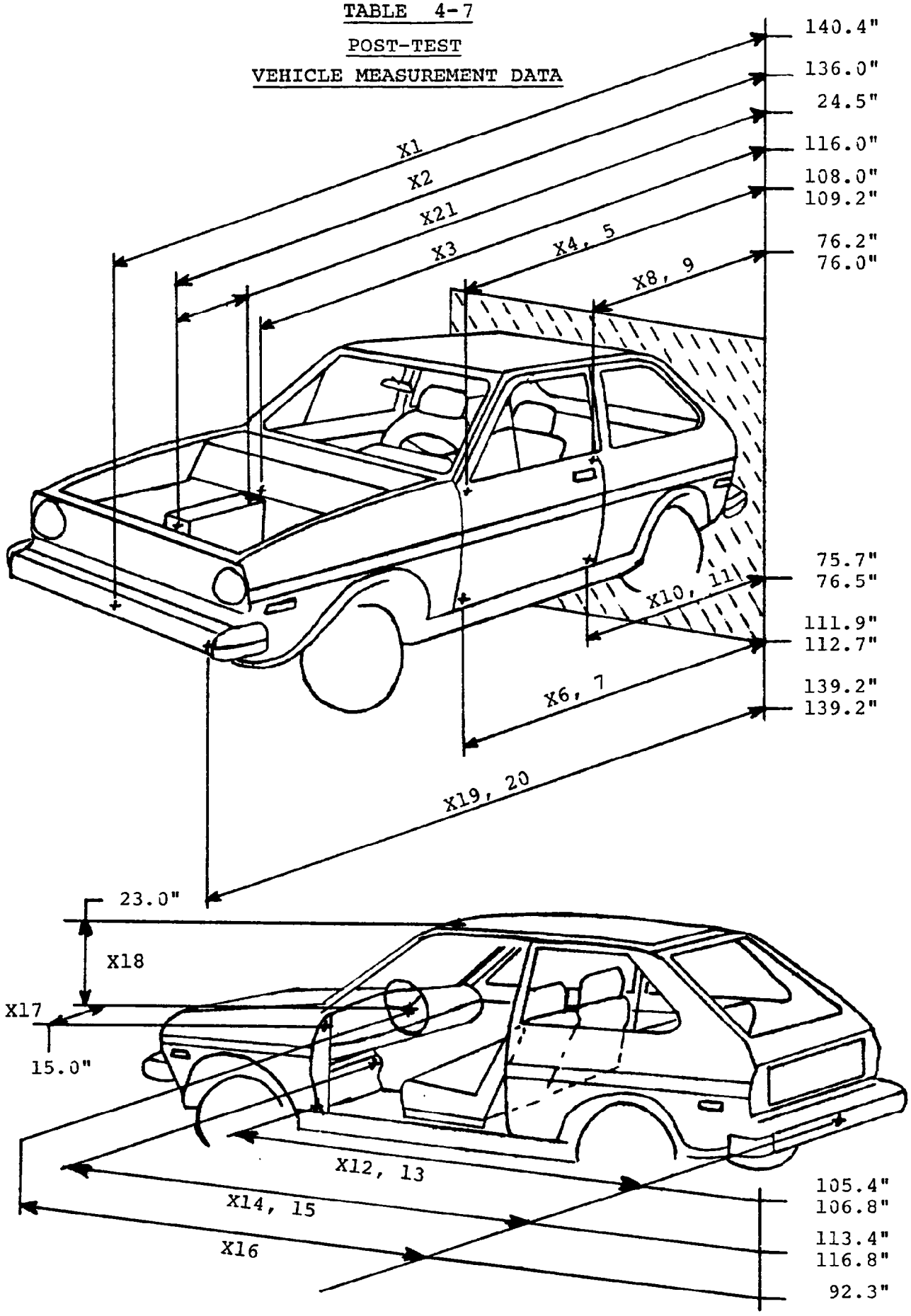


TABLE 4-8

SUMMARY

PRE-TEST AND POST-TEST VEHICLE DIMENSIONS

Measurement Point	Pre-Test	Post-Test	Difference
X1	163.3"	140.4"	22.9"
X2	149.0"	136.0"	13.0"
X3	121.0"	116.0"	5.0"
X4	109.5"	108.0"	1.5"
X5	109.8"	109.2"	0.6"
X6	113.0"	111.9"	1.1"
X7	113.4"	112.7"	0.7"
X8	75.6"	76.2"	+0.6"
X9	76.2"	76.0"	0.2"
X10	76.7"	75.7"	1.0"
X11	77.1"	76.5"	0.6"
X12	111.2"	105.4"	5.8"
X13	111.0"	106.8"	4.2"
X14	122.5"	113.4"	9.1"
X15	123.1"	116.8"	6.3"
X16	94.7"	92.3"	2.4"
X17	14.3"	15.0"	+0.7"
X18	17.0"	23.0"	+6.0"
X19	161.6"	139.2"	22.4"
X20	162.0"	139.2"	22.8"
X21	31.5"	24.5"	7.0"

TABLE 4-9
FMVSS 212/219/301-75
CAMERA POSITIONS

VEHICLE 1980 Subaru DL1600 - 4WD

NHTSA NO. 801305 TEST DATE November 24, 1980

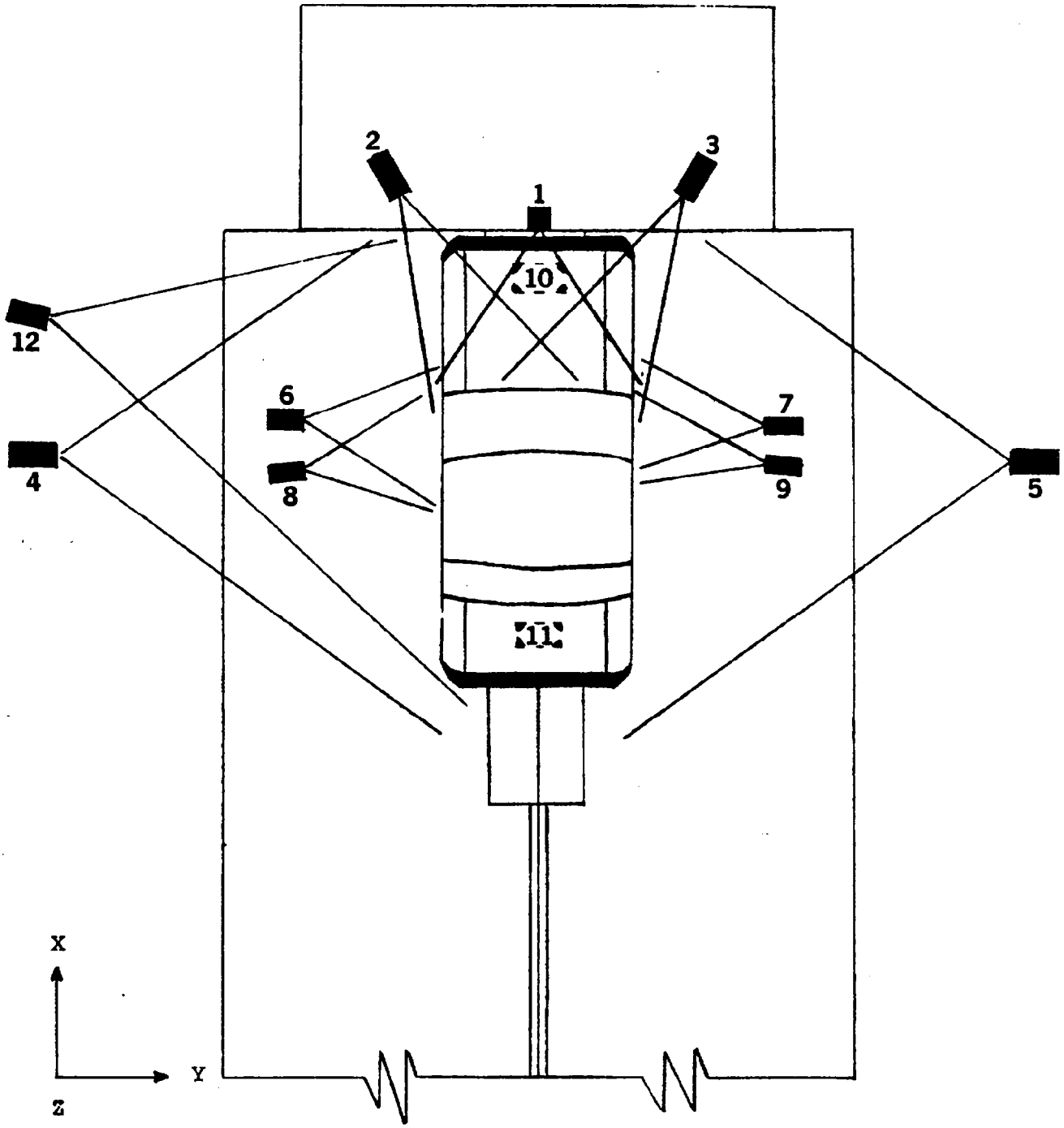


TABLE 4-10
FMVSS 212/219/301-75
CAMERA POSITIONS

VEHICLE 1980 Subaru DL1600 - 4WD

NHTSA NO. 801305 TEST DATE November 24, 1980

1.	Photo-Sonics 13mm 500FPS	X 11.0" Y - 0 - Z 238.0"	2.	Photo-Sonics 13mm 500FPS	X -7.5" Y 16.0" Z 104.5"
3.	Photo-Sonics 13mm 500FPS	X -5.5" Y 32.7" Z 100.0"	4.	Photo-Sonics 13mm 500FPS	X 33.0" Y 320.0" Z 49.5"
5.	Photo-Sonics 13mm 500FPS	X 54.6" Y 194.0" Z 44.0"	6.	Locam 12.5mm 500FPS Dummy Head	X 76.0" Y 99.0" Z 55.5" 82.0"
7.	Locam 13mm 500FPS Dummy Head	X 78.3" Y 98.0" Z 57.0" 83.0"	8.	Locam 15mm 500FPS Dummy Head	X 84.0" Y 99.0" Z 56.0" 83.0"
9.	Locam 12.5mm 500FPS Dummy Head	X 86.3" Y 96.0" Z 57.0" 81.0"	10.	Photo-Sonics 13mm 500FPS	X 5.0" Y 1.0" Z -33.0"
11.	Photo-Sonics 13mm 500FPS	X 162.0" Y 5.0" Z -31.0"	12.	Canon Scoopic 12.5 - 75mm 24FPS - Documentary -	

SECTION 5

SECTION 5

5.0 TEST FACILITIES AND EQUIPMENT

Approved Engineering Test Laboratories (AETL) collision barriers, vehicle static rollover machine, and data processing/computer analysis test facilities are located at the Fullerton, California Division.

This section discusses these specialized facilities, along with associated equipment and instrumentation required for the performance of this test.

5.1 FRONTAL COLLISION BARRIER FACILITY

5.1.1 The frontal (fixed) collision barrier conforms to the requirements as set by the NHTSA Office of Vehicle Safety Compliance (OVSC) and as defined in the Laboratory Procedures for FMVSS 212/219/301-75, TP219-02, dated January 9, 1979, with the following special characteristics.

5.1.2 The fixed collision barrier is a steel clad, steel reinforced concrete block with a 6'4" X 12' face. The face is 1" steel plate faced with 3/4 inch plywood. The total mass of the structure is approximately 200,000 pounds, with a substantial portion below ground to provide resistance against sliding or tipping of the barrier during impact.

SECTION 5

5.1.3 The facility consists of a 500 foot concrete paved runway, with a steel monorail embedded in the approach surface. Two camera pits are provided to allow photographing the test vehicle at impact. One pit is located immediately in front of the fixed collision barrier and is 36 inches wide (expandable to 48 inches), 7 feet deep, and 23 feet long (3 feet of the pit length extends under the barrier face). The second (mid) pit with removable monorail section is located approximately 160 feet from the fixed collision barrier and is 43 inches wide, 7 feet deep, and 23 feet long.

5.1.4 Tow propulsion is provided by a fixed prime mover and continuous cable drive system located near the mid camera pit position. The power plant for the tow cable system is a 200 h.p. synchrouous electric motor, coupled to an electronically controlled Eddy Current Clutch and a 4:1 gear reduction transfer assembly.

The endless 1/2 inch diameter steel tow cable is wrapped around the drive pulley and is tensioned by a pneumatic loaded idler wheel. The tow cable passes through the fixed collision barrier and around fixed idler pulleys to complete the loop. The test vehicle or moving collision barrier is towed by a dolly assembly attached to the vehicle

or moving collision barrier by a shear pin release mechanism. For a fixed collision barrier test, the test vehicle is towed within 20 feet of the fixed barrier, at which point the towing dolly assembly is disconnected from the test vehicle and the test vehicle proceeds under its own momentum for the final 20 feet to impact. For a moving collision barrier test, the moving collision barrier is towed within 5 feet of the test vehicle, at which point the towing dolly is disconnected from the moving collision barrier and the moving collision barrier proceeds under its own momentum for the final 5 feet to impact. Heavy steel stops actuate the tow cable release mechanism and prevent the towing dolly from continuing past the point of impact. The towing dolly is designed to fit inside the monorail such that it is constrained in the vertical and lateral directions, and capable of sliding freely along the monorail.

5.2 OBLIQUE ANGLE COLLISION BARRIER

5.2.1 The oblique angle collision barrier conforms to the requirements as set by NHTSA Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures TP219-02, with the following special characteristics.

5.2.2 The oblique angle collision barrier is constructed of a flat 1 1/2 inch steel plate faced with 3/4 inch plywood. The barrier face is 6' X 12' and is adjustable for left or right angle impacts by means of seven tubular gussets that attach to the standard fixed frontal collision barrier to form a rigid buttress structure.

5.3 MOVING COLLISION BARRIER

5.3.1 The moving collision barrier conforms to the requirements as set by Federal Motor Vehicle Safety Standard No. 208, Paragraph S8.2 with the following special characteristics.

5.3.2 The chassis is constructed of 12 inch steel channel with tubular frame gussets. The flat impacting face plate is 1/2 inch steel plate faced with 3/4 inch plywood. The face plate is reinforced with 6 inch steel channel horizontally welded to the chassis to form a rigid symetrical structure. A camera boom extends above the barrier face plane to provide a view of barrier to vehicle impact. The barrier assembly weighs 3,977 pounds and has a four wheel electric brake system.

SECTION 5

5.4 VEHICLE STATIC ROLLOVER MACHINE

5.4.1 The vehicle static rollover machine conforms to the requirements as set by the NHTSA Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures TP219-02 with the following special characteristics.

5.4.2 The vehicle static rollover machine is constructed of 10 inch square tube with adjustable wheelbase and tread width platforms to accommodate the various test vehicles. The total usable platform area is 8 feet wide and 25 feet long with special design feature to accomodate vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less with various body configuration heights to 12 feet. The test vehicle can be rotated left or right and can turn each 90° rotational increment in approximately two (2) minutes.

5.5 IMPACT VELOCITY MEASUREMENT

The test vehicle impact velocity is measured by two (2) separate certification timing trap systems located within five (5) feet of the vehicle to fixed collision barrier face and to one side on the approach apron. Each timing

trap system contains two (2) optical beams, mounted twenty four (24) inches apart, in a mechanical housing assembly providing a start-stop signal to a digital display counter. As the test vehicle traverses the impact apron, a blade attached to the test vehicle rear fender interrupts each optical beam providing the precise measurement of time interval for the test vehicle to advance the known distance between the optical beams. Each interval of time measurement is stored in the digital display counter and photographically recorded.

The moving collision barrier impact velocity is measured by two (2) separate certification timing trap systems located within five (5) feet of the moving collision barrier to vehicle impact location and to one side on the approach apron. Each timing trap system contains two (2) optical beams, mounted twenty-four (24) inches apart, in a mechanical housing assembly providing a start-stop signal to a digital display counter. As the moving barrier traverses the impact apron, a blade attached to the moving barrier side interrupts each optical beam providing the precise measurement of time interval for the moving barrier to advance the known distance between the optical beams. Each interval of time measurement is stored in the digital display counter and photographically recorded.

SECTION 5

5.6 PHOTOGRAPH COVERAGE

5.6.1 Because FMVSS 212/219/301-75 may be a combined test, it is necessary that all photographic coverage of the test vehicle be done at one time with specific photographs to document the areas for Vehicle Safety Compliance consideration; windshield area and the fuel system. Each report will utilize only those photographs pertaining to the Vehicle Safety Compliance Test being reported.

5.6.2 FIXED BARRIER IMPACT TEST

Motion picture coverage of the event employs seven (7) 16mm 1B Photo-Sonics cameras and four (4) 16mm 51 Redlake Locam cameras using color film at 500 frames per second (fps). Also a 16mm Canon Scoopic 24 frames per second (fps) camera with color film is used to record vehicle pre-test condition, vehicle in-run, impact, and post-impact vehicle conditions including the rollover increments for documentary purposes. The eleven (11) high speed cameras are located at stationary positions near the point of impact. One is an overhead camera mounted on a tower above the fixed barrier face on centerline of the test vehicle at impact. Its field of view includes the barrier face and the front of the vehicle to a point about one foot aft of the windshield. A second and third camera are mounted on top of the fixed barrier with

their field of view concentrating on the windshield area (FMVSS 212/219). The fourth and fifth cameras each have a side view of the test vehicle at impact. The sixth, seventh, eight, and ninth cameras are located adjacent to the test vehicle front passengers compartment and positioned to photograph motion of each test dummy at impact. The tenth and eleventh cameras are located in the pit and positioned to photograph the underside of the engine compartment and fuel tank area.

5.6.3 MOVING BARRIER IMPACT TEST

Motion picture coverage of the event employs four (4) 16mm 1B Photo Sonics cameras and two (2) 16mm 51 Redlake Locam cameras using color film at 500 frames per second (fps). Also a 16mm Canon Scoopic 24 frames per second (fps) camera with color film is used to record vehicle pre-test condition, barrier in-run, impact, and post-impact vehicle conditions including the rollover increments for documentary purposes. Five (5) of the high speed cameras are located at stationary positions near the point of impact. Three (3) cameras are located in the pit and positioned to photograph the underside of the engine compartment, with overlapping field of views, aft to the fuel tank area. The fourth and fifth cameras each have a side view of the test vehicle at impact.

SECTION 5

The sixth camera is attached to the moving collision barrier to photograph the contact between the barrier and the test vehicle.

5.6.4 TIME PULSE GENERATOR

Time data from two (2) sources are contained in the high speed film coverage. The first is a time reference of 100 pulse per second (pps) light emitting diode event mark along the film adge. This pulse is generated by the time pulse generator and fed to all high speed cameras. Thus, it is possible to relate film data to a real time base. The second time record is an indication of time zero (moment of impact). This is accomplished by a trip switch and event mark system. The trip switch is positioned at the impact point so that it triggers the light emitting diode event mark along the film edge at the moment of bumper-barrier contact. Thus, the particular film frame corresponding to the point of impact is clearly indicated on all the high speed film.

SECTION 5

5.7 DATA ACQUISITION AND REDUCTION

The data acquisition and analysis system used for acquiring occupant response and vehicle acceleration are shown schematically in Figure 5-1. A complete list of instrumentation is provided in Table 5-1. An itemized procedure for acquiring data is provided on Table 5-2.

Prior to the vehicle impact test the onboard instrumentation package is installed and a calibration and null reference check is performed to checkout all data analog devices including the FM magnetic tape recorders. The moment of impact trigger switch attached to the vehicle is also checked out. Immediately following vehicle impact a post-impact calibration and null reference check is performed.

The analog data is then played back into a Hewlett Packard Digital Fourier Analyzer (DFA) system using a HP 2100S mini computer with 32K word core storage. This system uses four program controlled analog filters which provides predigitizing filter capability of 48 db/octave above 1250 Hz.

SECTION 5

The DFA is a hard disc based system with standard HP design software for performing data acquisition and analysis functions. The HP software is programmed using direct keyboard functions to automate the data reduction process. The data is entered into temporary storage, four channels (one set) at a time. Table 5-3 defines each data channel and data set. The data sets are divided into driver and passenger tape recorder groups to facilitate simultaneous data acquisition for the head, chest and vehicle accelerometers to assure appropriate calibration of injury criteria and vehicle dynamics. At the time of entry, test personnel enter the appropriate calibration for each data channel and the computer then scales the data appropriately. When all data has been acquired it is moved as a vehicle set to permanent storage on a removable magnetic disc. (Nine vehicle sets are stored on each magnetic disc. All magnetic discs and FM recorder tapes are retained on file at AETL).

The only modifications to the data at the time of permanent storage is the filtering and digitizing process of the FM tape recorder (2500 Hz) and the DFA (1250 Hz sampling for a 200 ms window). After the data is moved to permanent storage it is recalled by test personnel and plotted with the appro-

priate label and vehicle designation. As the data is recalled, the DFA is programmed to automatically filter the data with the appropriate SAE filter.

Figure 5-2 illustrates the SAE class 60, 180, 600 and 1000 filters applied to the data. These filters are in accordance with SAE J211a, Instrumentation for Impact Tests. These recommended filters are quadratic double pole with 65% damping and a 12 db/octave rolloff. They are applied to the data using a Fast Fourier Transform (FFT) of the data, frequency domain multiplication, and an inverse Fast Fourier Transform (FFT) of the product.

It should be noted that in Figure 5-2 the predigitizing analog filter attenuates all signals above the 1250 Hz cutoff frequency. This has no effect on the class 60 or class 180 data. The class 600 data is within SAE J211a recommendation to 1900 Hz and -20 db. Above 1900 Hz the class 600 data is attenuated at 48 db/octave instead of 24 db/octave. This has very negligible effect on the class 600 data. The modification of class 1000 data, by predigitizing filter, is attenuation of 48 db/octave above

1250 Hz instead of 24 db/octave above 1650 Hz. Examination of typical class 1000 data shows the high frequency components between 1250 Hz and 1650 Hz are uniformily less than 3 percent of the largest components at lower frequencies. The effect of the predigitizing filter has a very slight smoothing of the plotted data.

Class 60 filters are applied to the vehicle acceleration and belt restraint forces, while the class 180 filter is applied to the chest acceleration forces. The class 600 filter is applied to the femur forces and class 1000 filter is applied to the head acceleration forces.

5.7.1 IMPACT DATA

All impact data is presented in computer plots of data digitized at 200 microseconds. Special SAE filters are applied to the appropriate data sets. Each data plot includes labeling, defining the test vehicle, filter class, and the complete identification of the data plotted.

5.7.1.2 DUMMY HEAD DATA

The dummy head accelerations are processed as class 1000 data, and the Head Injury Criteria (HIC) calculation is performed. The HIC calculations are maximized for start time (T1) and end time (T2), using a manual iteration routine, usually requiring about ten interations and between 5,000 and 10,000 combinations of start and end times. Data output is in the form of computer plots with the final HIC calculations. Listing of data value and HIC calculations are available, but not provided in the final report.

5.7.1.3 DUMMY CHEST DATA

The dummy chest accelerations are processed as class 180 data, and direct Chest Severity Index (CSI) calculations and the highest acceleration value of at least three millisecond duration (3 ms clip) are performed. Data output is in the form of computer plots with the 3 ms clip calculations.

5.7.1.4 FEMUR LOAD DATA

The dummy femur loads are processed as class 600 data, and presented as computer plots.

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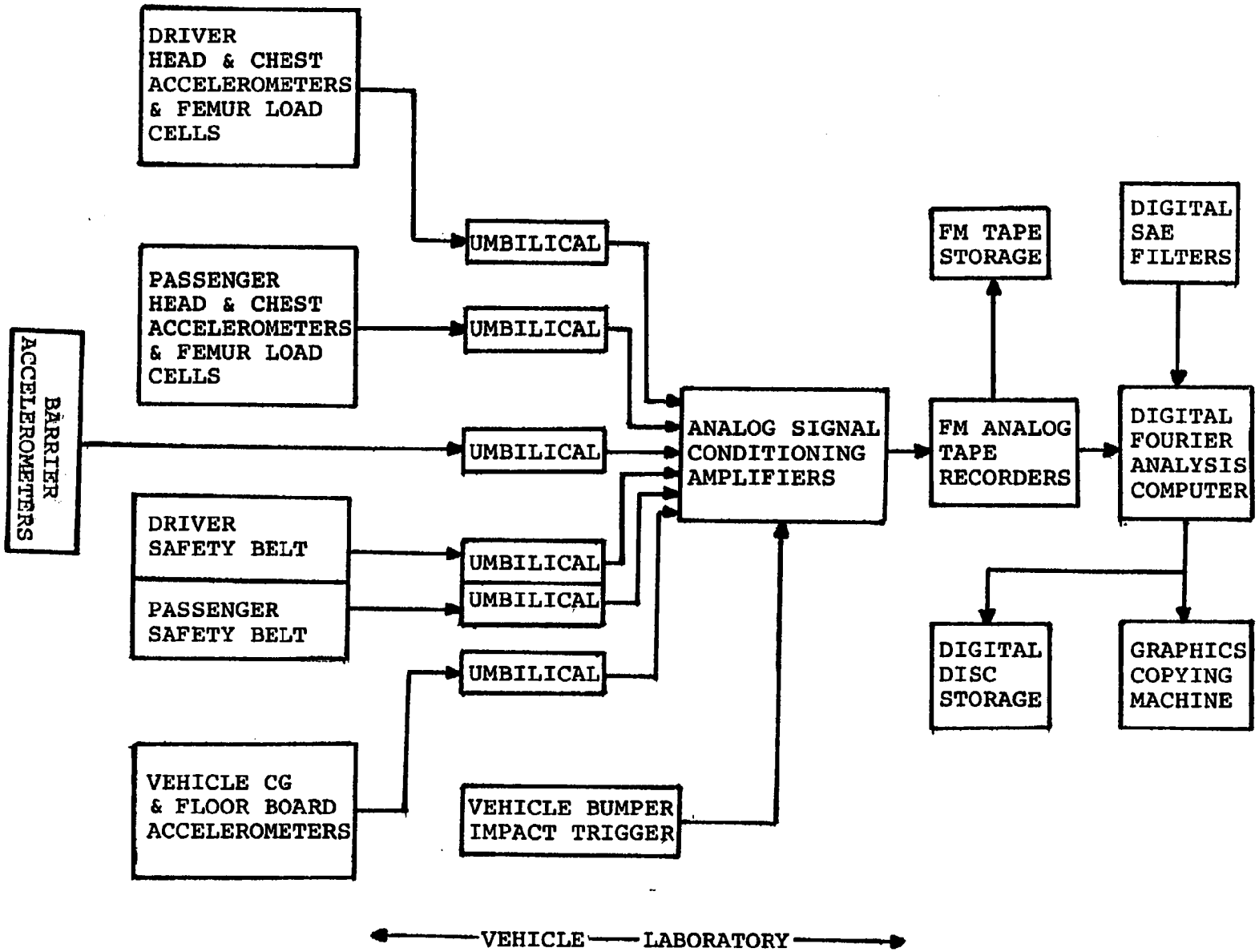
5.7.1.5 RESTRAINT LOAD DATA

The dummy restraint loads are processed as class 60 data, and presented as computer plots.

5.7.1.6 VEHICLE ACCELERATION DATA

The vehicle accelerations are processed as class 60 data, and presented as computer plots. Additionally, the longitudinal vehicle acceleration is integrated to provide approximate vehicle velocity change and vehicle crush during the impact event.



VEHICLE AND OCCUPANT CRASH IMPACT DATA ACQUISITION SYSTEM

FIGURE 5-1

TABLE 5-1 INSTRUMENTATION FOR CRASH TEST

Instrument	Manufacturer	Model No.	Full Scale	Accuracy	Frequency Max.
Accelerometers, Head, Chest, Vehicle	Endevco	2262C-200	200g	±1%	3600 Hz
Load Cells, Femurs	GSE	2430	3000 lb	±1%	>3600 Hz
Load Cells, Safety Belts	GSE	2500	3000 lb	±1%	>3600 Hz
Contact Switch, Impact	AETL	-	2 V	-	<200 us rise time
FM Tape Recorder	Bell & Howell	4020	±2.8 V	47 db SNR	2500 Hz WB
Programmable Filter, All Data	Hewlett Packard	54440A	-	0.5%	1250 Hz, 48 db/oct
Analog-Digital Converter, All Data	Hewlett Packard	5466B	-	0.5%	200 us sampling
Analysis Computer, All Analysis	Hewlett Packard	2100S	32 K Words	16 Bit Word	-
Disc Drive	Hewlett Packard	7900A	5 Meg Words	-	-

TABLE 5-2

DATA ACQUISITION AND REDUCTION PROCESS

STEP	DESCRIPTION
1	DA System Installation
2	DA System Pre-Impact Calibration
3	Impact Trigger Checkout
4	Vehicle Impact Performed
5	DA System Post-Impact Calibration
6	Data Reproduced From FM Tape Into Computer a) Data analog filtered at 1250 Hz b) Data digitized at 200 ms sample rate c) Data sychronized by impact trigger signal
7	Digitized Data Examined
8	Data Transfered Permanent Disc Storage
9	Appropriate SAE Filters Are Applied
10	Each Data Signal Plotted With Lables
11	Chest Severity Index Values Determined
12	Head Injury Criteria Values Determined
13	Vehicle Dynamics Evaluated (MPH & Crush)

TABLE 5-3

DATA DESIGNATIONS FOR VEHICLE CRASH IMPACT DATA ACQUISITION

DATA SET	TAPE NO.	CHANNEL NO.	DESCRIPTION
1	1	1	Driver Longitudinal Head Acceleration Ax
1	1	2	Driver Lateral Head Acceleration Ay
1	1	3	Driver Vertical Head Acceleration Az
1	1	4	Driver Right Femur Force
2	1	5	Driver Longitudinal Chest Acceleration Ax
2	1	6	Driver Lateral Chest Acceleration Ay
2	1	7	Driver Vertical Chest Acceleration Az
2	1	8	Driver Left Femur Force
3	1	9	Driver Shoulder Belt Force
3	1	10	Driver Lap Belt Force
3	1	11	Left Rear Floor Pan Longitudinal Acceleration Ax
3	1	12	Vehicle Longitudinal CG Acceleration Ax
5	2	1	Passenger Longitudinal Head Acceleration Ax
5	2	2	Passenger Lateral Head Acceleration Ay
5	2	3	Passenger Vertical Head Acceleration Az
5	2	4	Passenger Right Femur Force
6	2	5	Passenger Longitudinal Chest Acceleration Ax
6	2	6	Passenger Lateral Chest Acceleration Ay
6	2	7	Passenger Vertical Chest Acceleration Az
6	2	8	Passenger Left Femur Force
7	2	9	Passenger Shoulder Belt Force
7	2	10	Passenger Lap Belt Force
7	2	11	Right Front Floor Pan Longitudinal Acceleration Ax

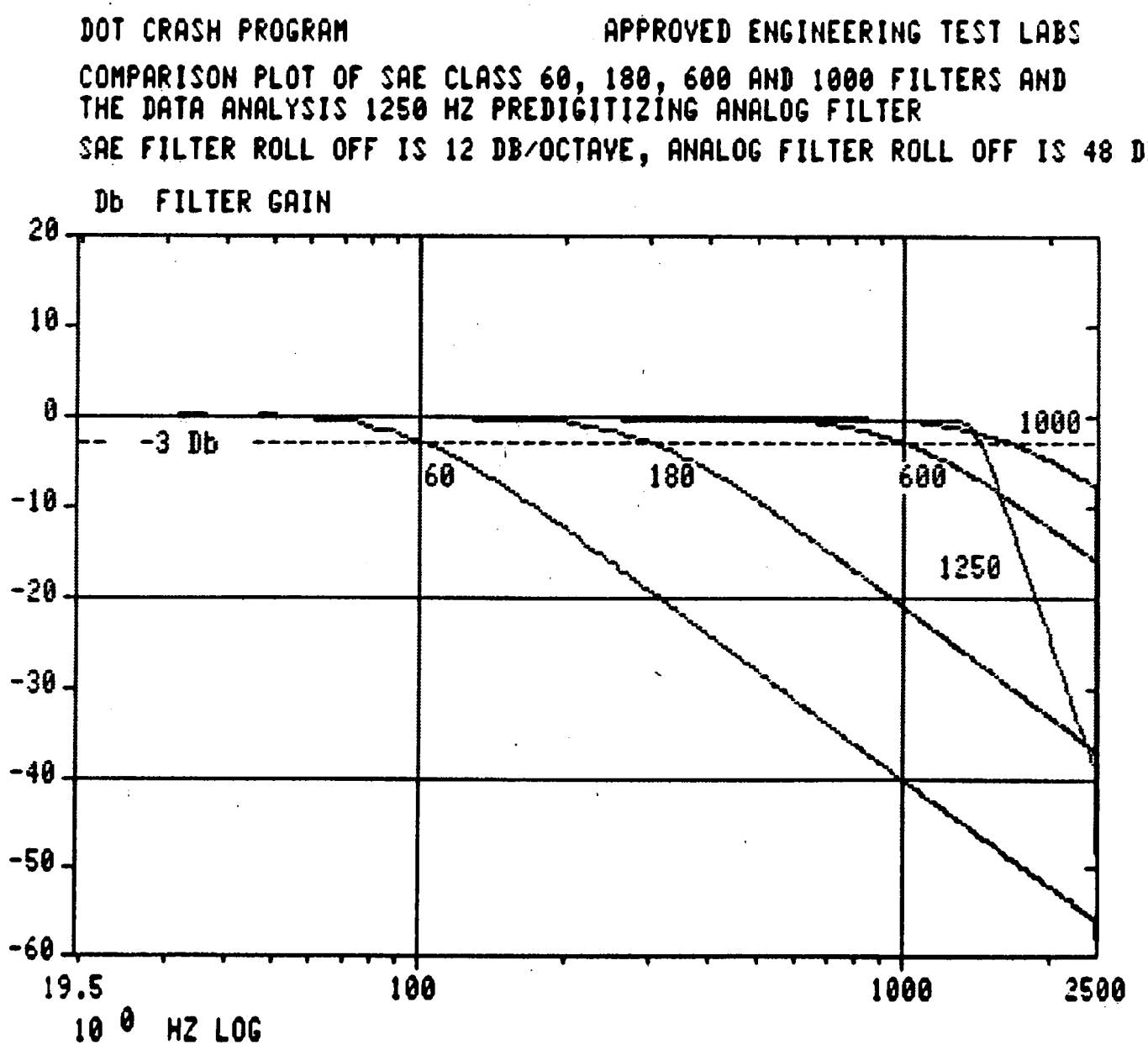

DOT CRASH PROGRAM
APPROVED ENGINEERING TEST LABS
COMPARISON PLOT OF SAE CLASS 60, 180, 600 AND 1000 FILTERS AND
THE DATA ANALYSIS 1250 HZ PREDIGITIZING ANALOG FILTER
SAE FILTER ROLL OFF IS 12 DB/OCTAVE, ANALOG FILTER ROLL OFF IS 48 DB/O
Db FILTER GAIN
20
10
0
-10
-20
-30
-40
-50
-60
-3 Db
60
180
600
1000
1250
19.5
100
1000
2500
10 0 HZ LOG

FIGURE 5-2

APPENDIX A

APPENDIX A

The following photographs are pre and post test dummy positions and interior compartment locations of dummy contact during the impact event.

Figure A-1

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Pre-Test, Driver Dummy View

Figure A-2

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Pre-Test, Passenger Dummy View

Figure A-3

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Driver Dummy View

Figure A-4

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Driver Dummy View

Figure A-5

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Driver Dummy Contact Area

Figure A-6

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Driver Dummy Contact Area

Figure A-7

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Passenger Dummy View

Figure A-8

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Passenger Dummy View

Figure A-9

1980 Subaru DL1600 - 4WD - 4 Door Station Wagon

NHTSA 801305

Post-Impact, Passenger Dummy Contact Area

APPENDIX B

APPENDIX B

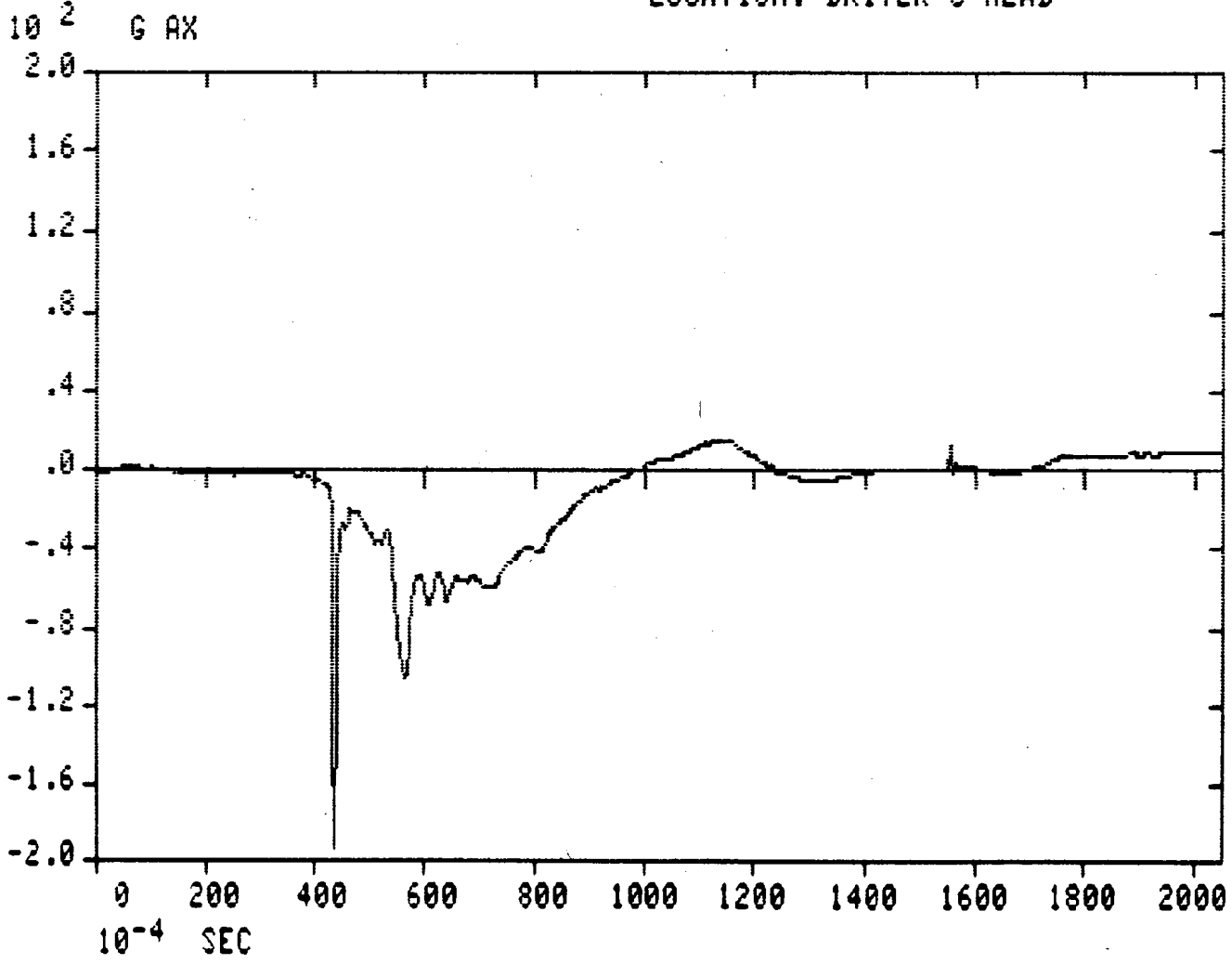
The following computer plots provide complete and comprehensive occupant response and vehicle acceleration during the frontal fixed barrier impact test of a 1980 Subaru DL1600 - 4WD - 4 Door Station Wagon, NHTSA 801305.

DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 1
DIRECTION: FORWARD
LOCATION: DRIVER'S HEAD

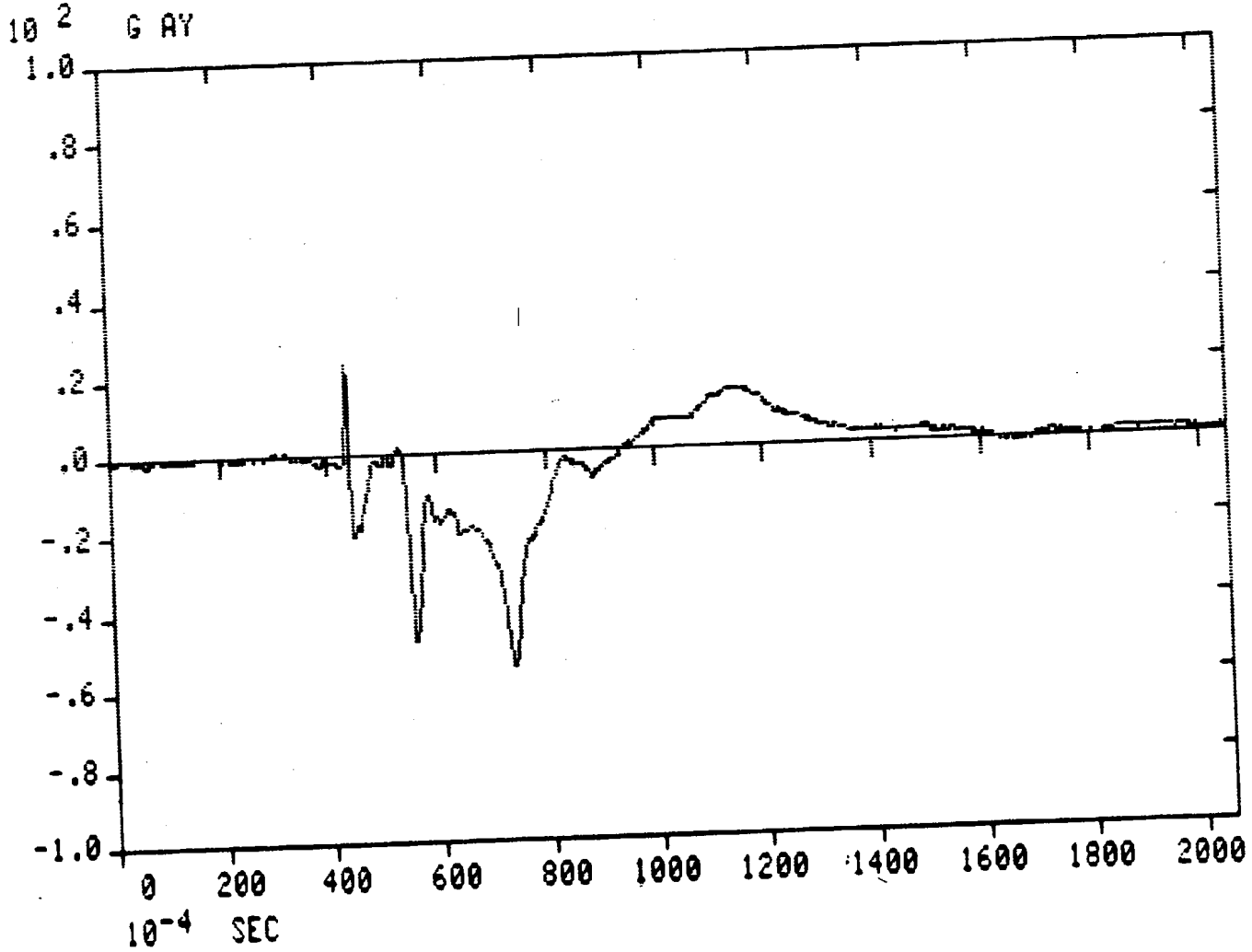


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER : CLASS 1000
ACCELEROMETER: TAPR 1, CH 2
DIRECTION: LEFT
LOCATION: DRIVER'S HEAD

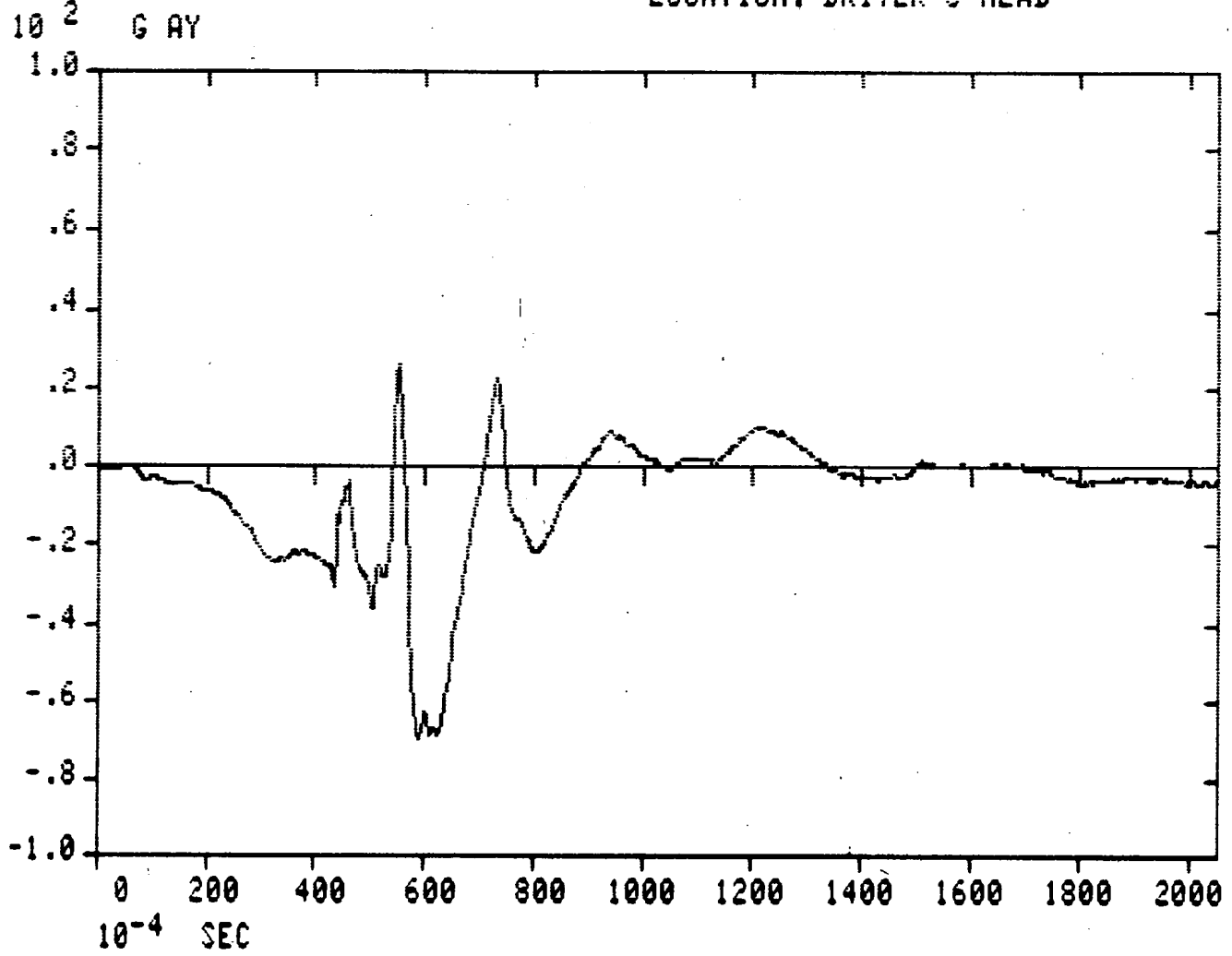


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH3
DIRECTION: UPWARD
LOCATION: DRIVER'S HEAD

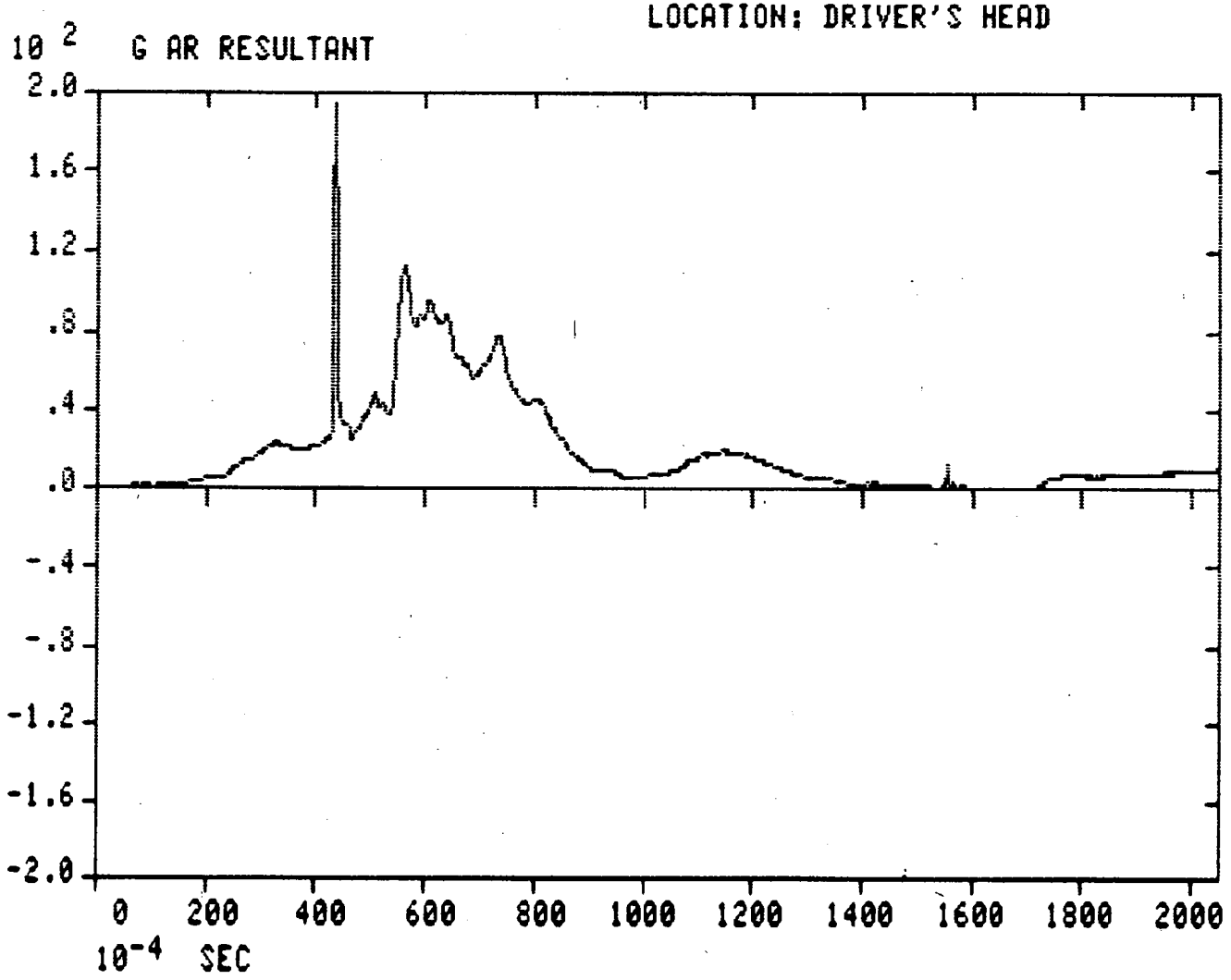


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 1-3
DIRECTION: RESULTANT OF XYZ
LOCATION: DRIVER'S HEAD

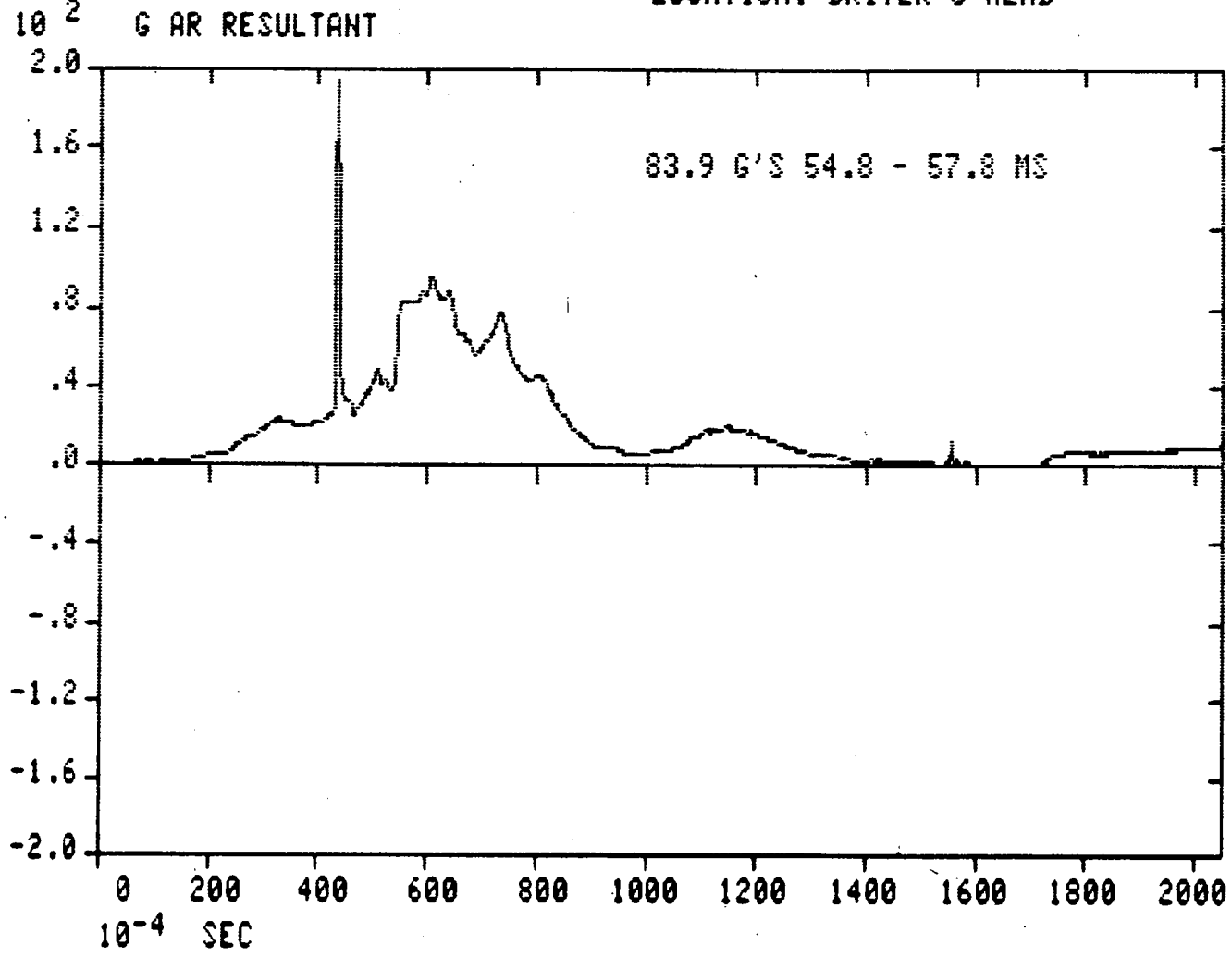


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 1-3
DIRECTION: RESULTANT OF XYZ
LOCATION: DRIVER'S HEAD

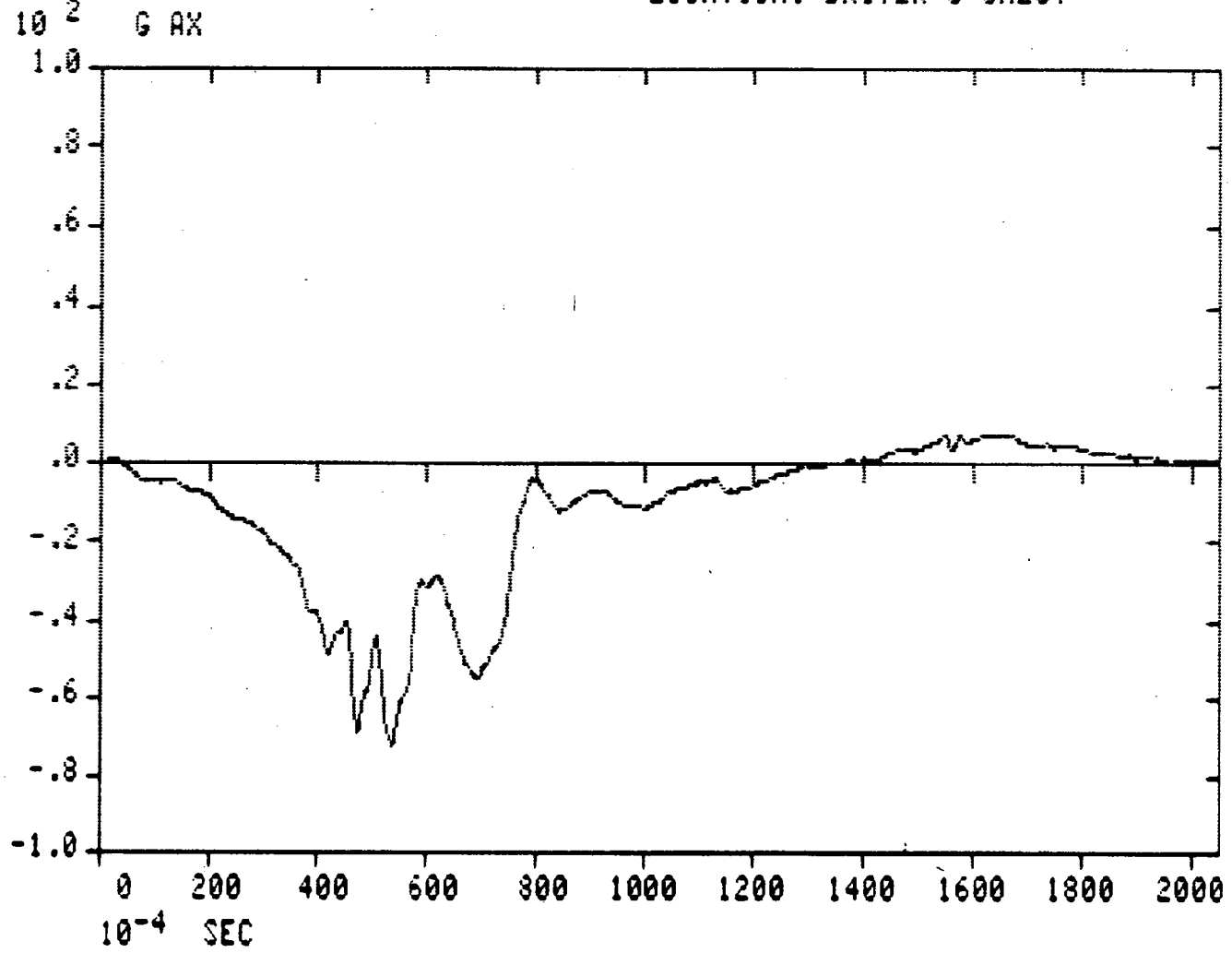


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 5
DIRECTION: FORWARD
LOCATION: DRIVER'S CHEST

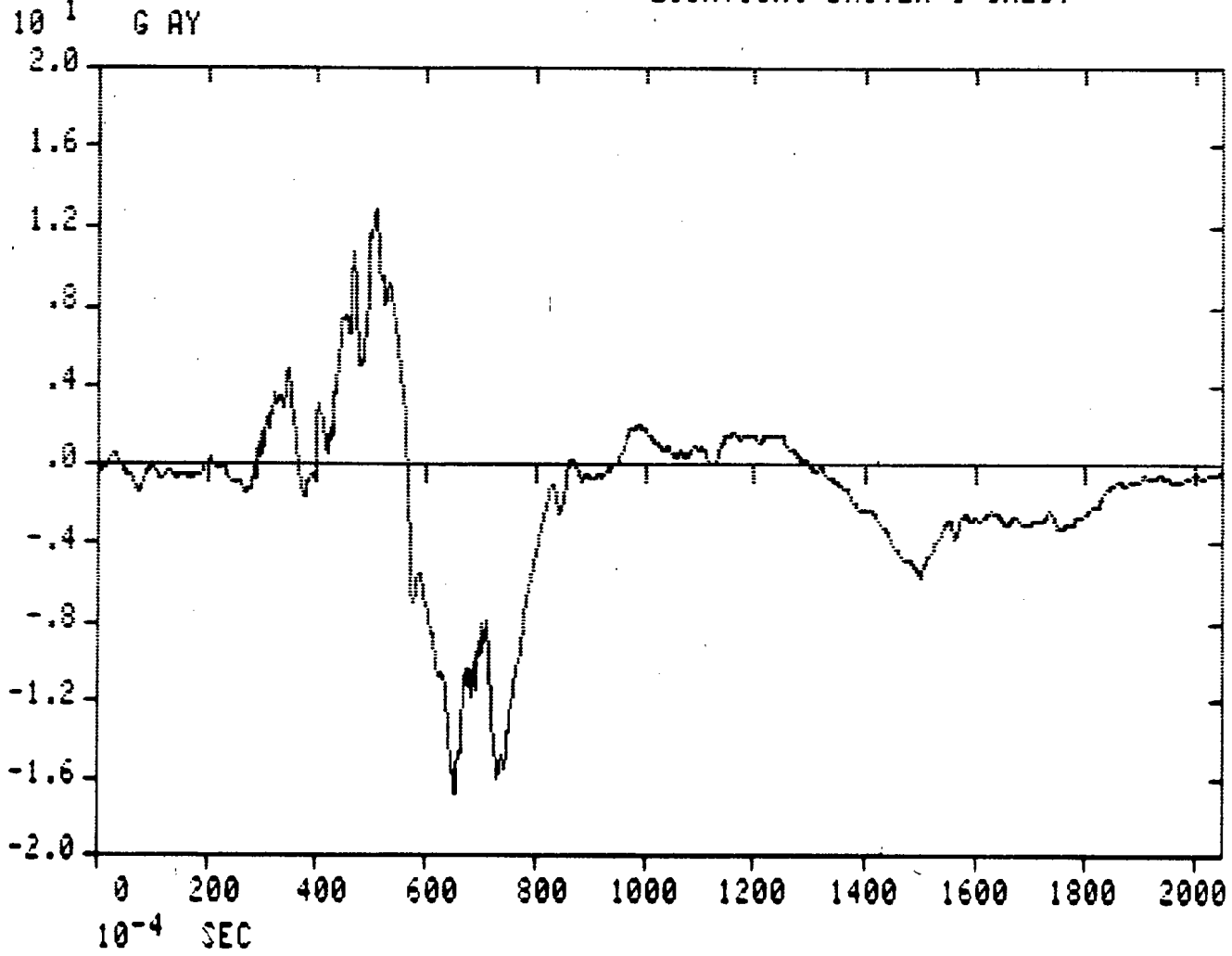


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 6
DIRECTION: LEFT
LOCATION: DRIVER'S CHEST

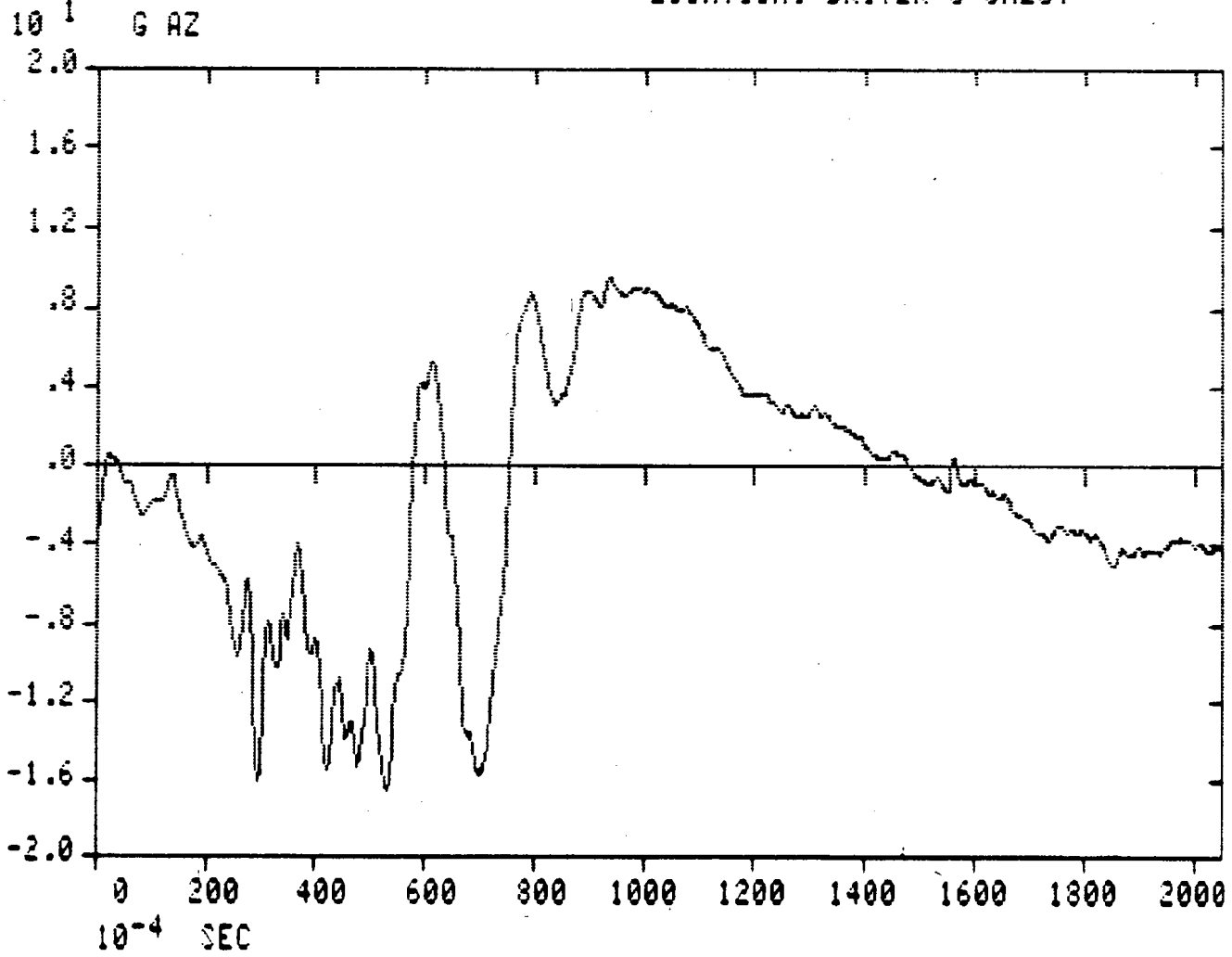


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 871-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 7
DIRECTION: UPWARD
LOCATION: DRIVER'S CHEST

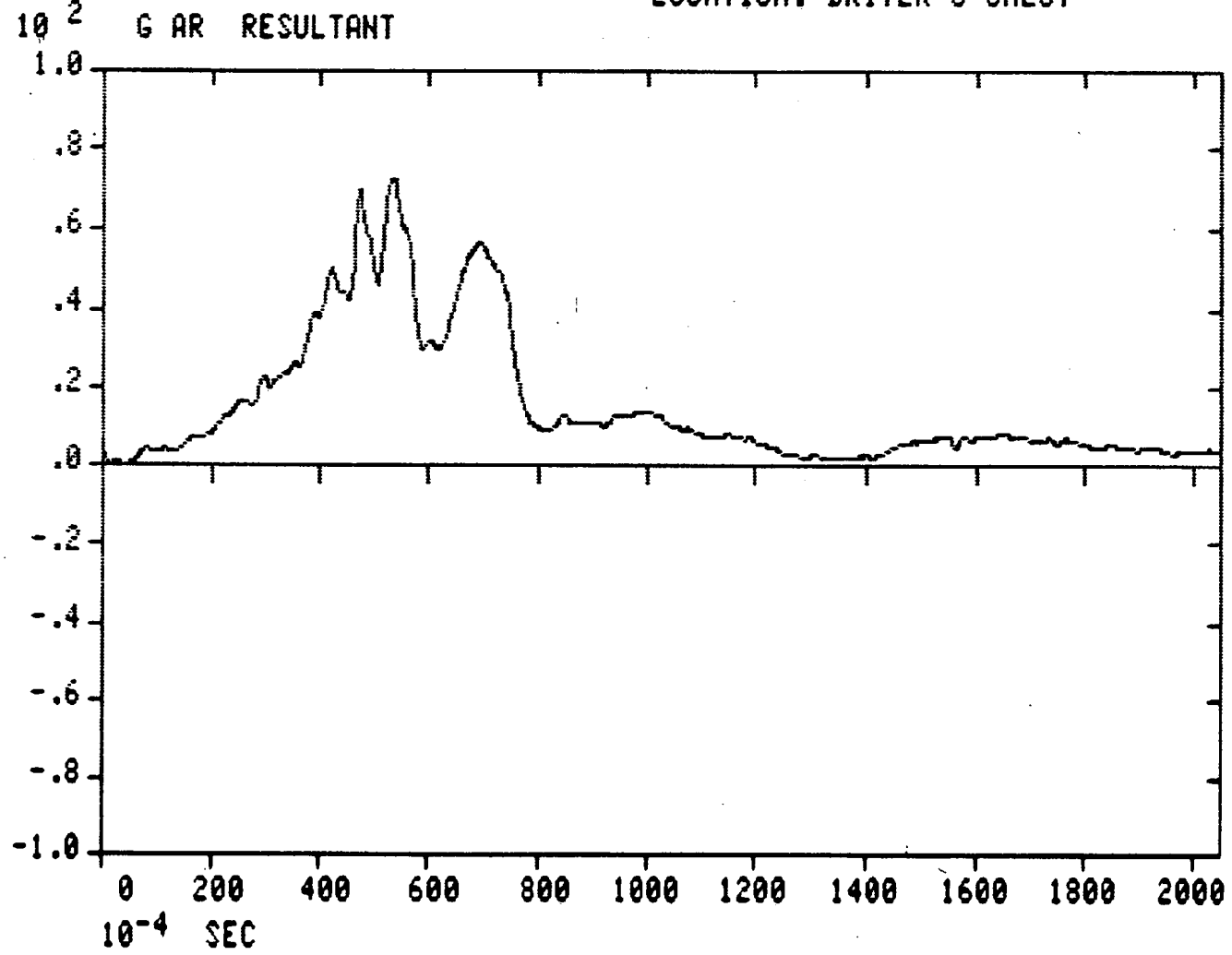


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 5-7
DIRECTION: RESULTANT OF XYZ
LOCATION: DRIVER'S CHEST

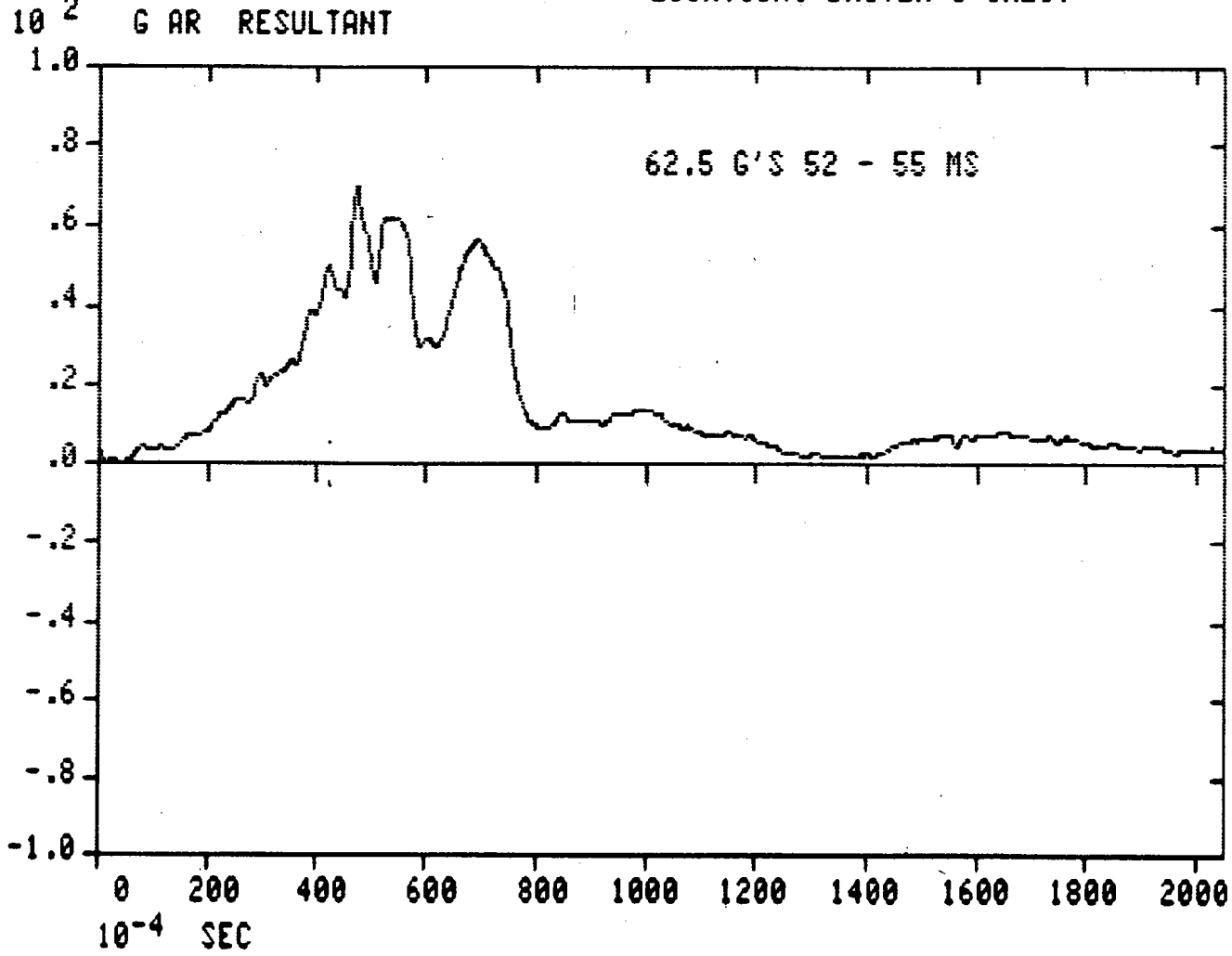


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 5-7
DIRECTION: RESULTANT OF XYZ
LOCATION: DRIVER'S CHEST

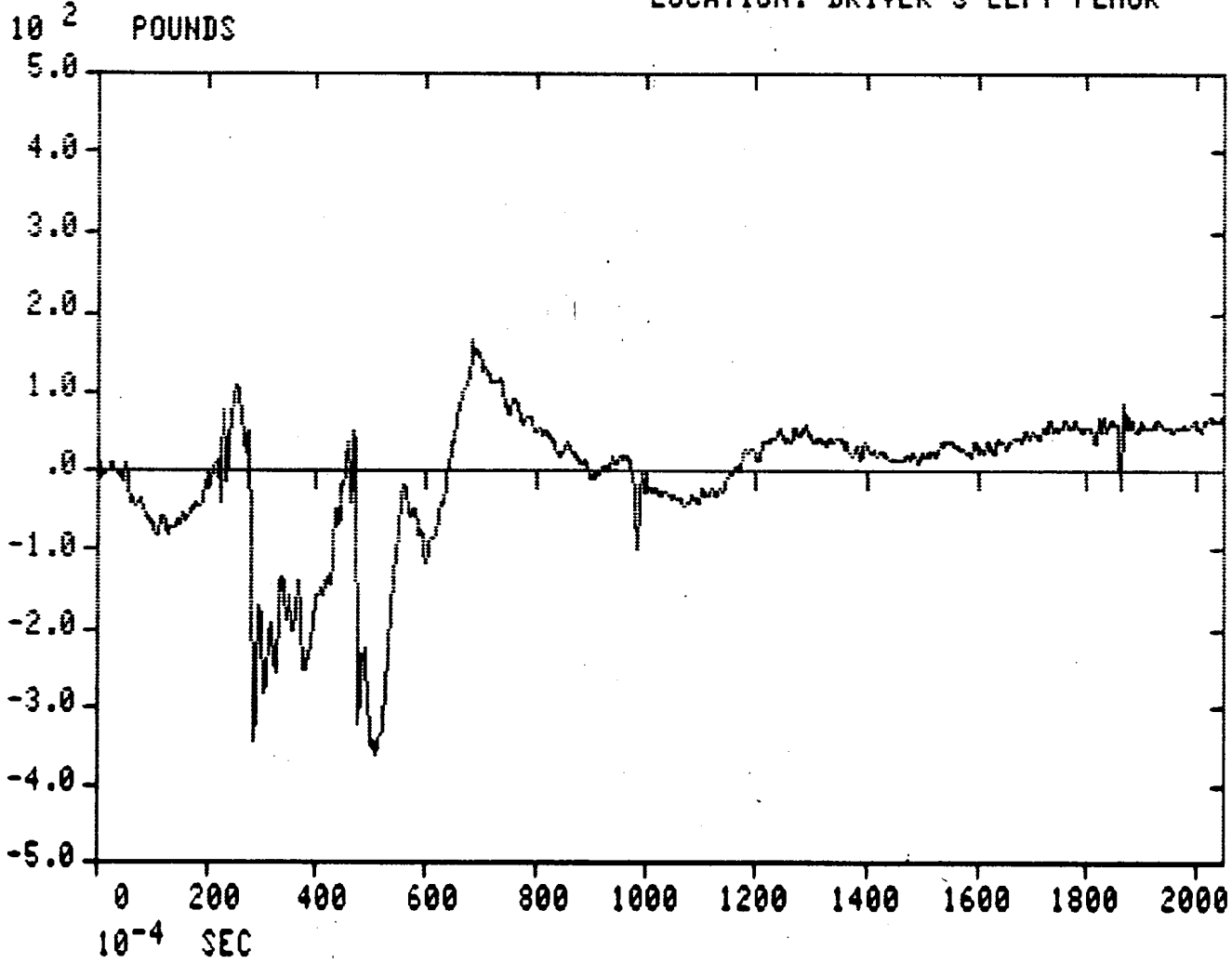


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 600
LOAD CELL: TAPE 1, CH 8
DIRECTION: TENSION
LOCATION: DRIVER'S LEFT FEMUR

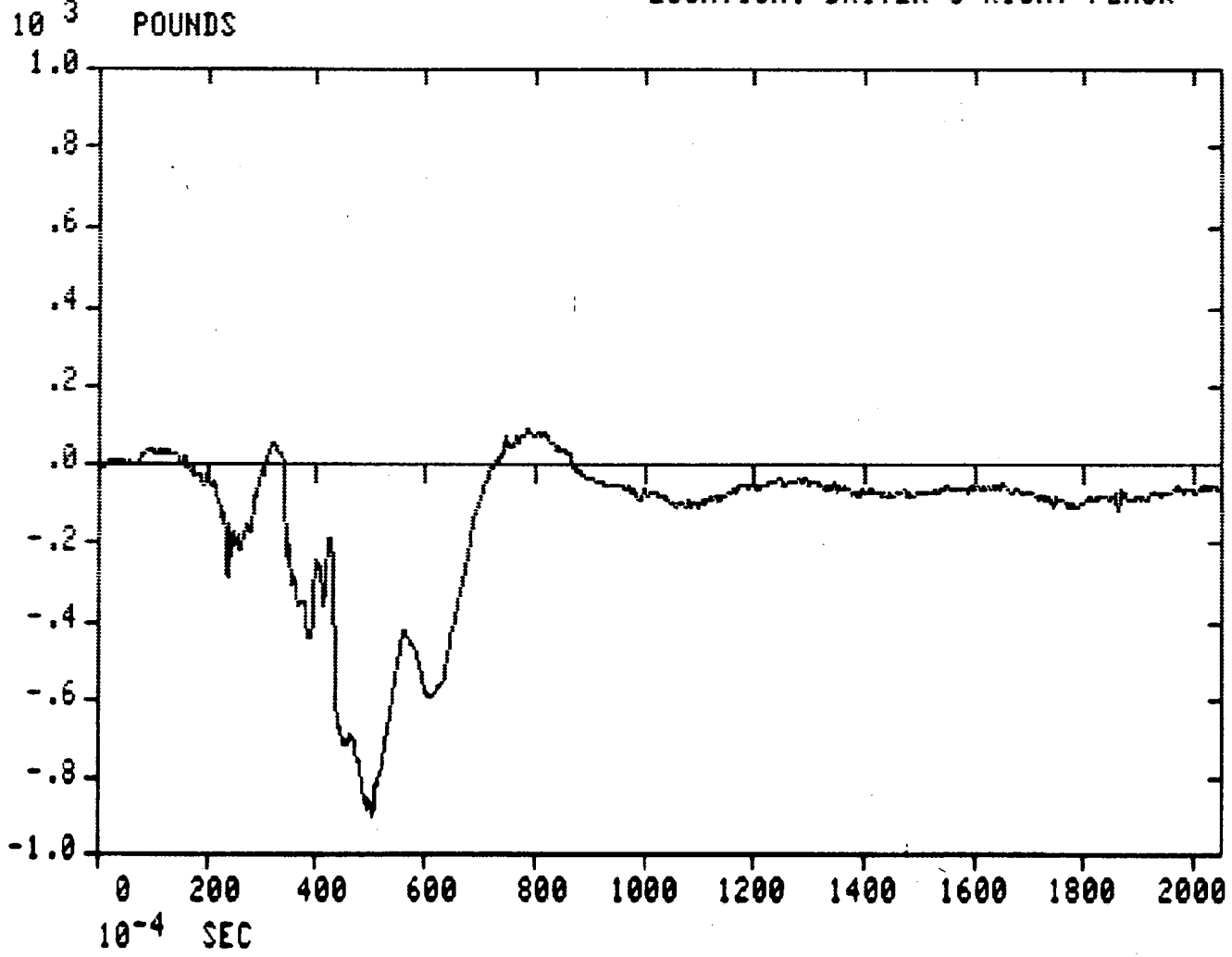


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 600
LOAD CELL: TAPE 1, CH 4
DIRECTION: TENSION
LOCATION: DRIVER'S RIGHT FEMUR

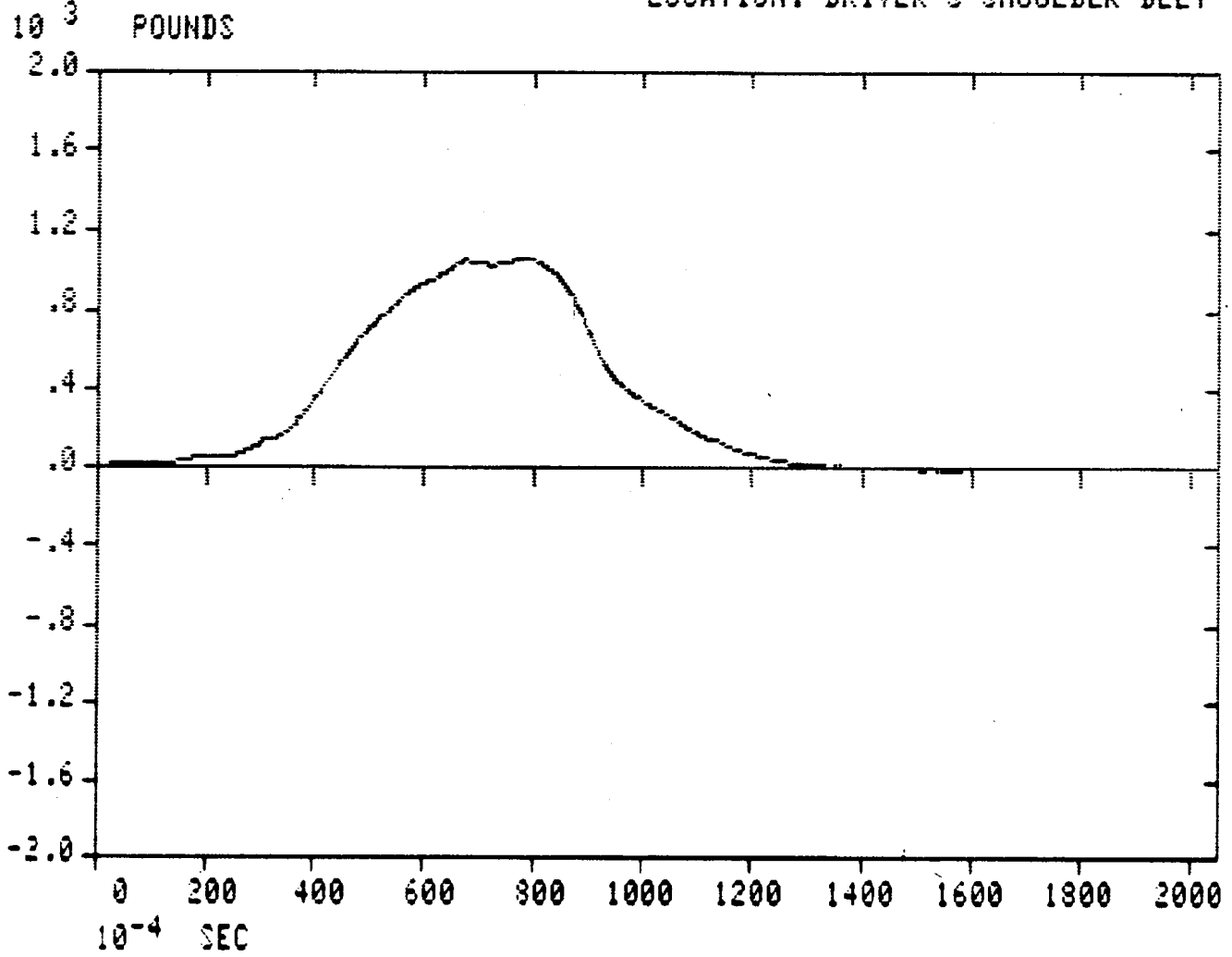


DOT CRACH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 35 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 60
LOAD CELL: TAPE 1, CH 9
DIRECTION: TENSION
LOCATION: DRIVER'S SHOULDER BELT

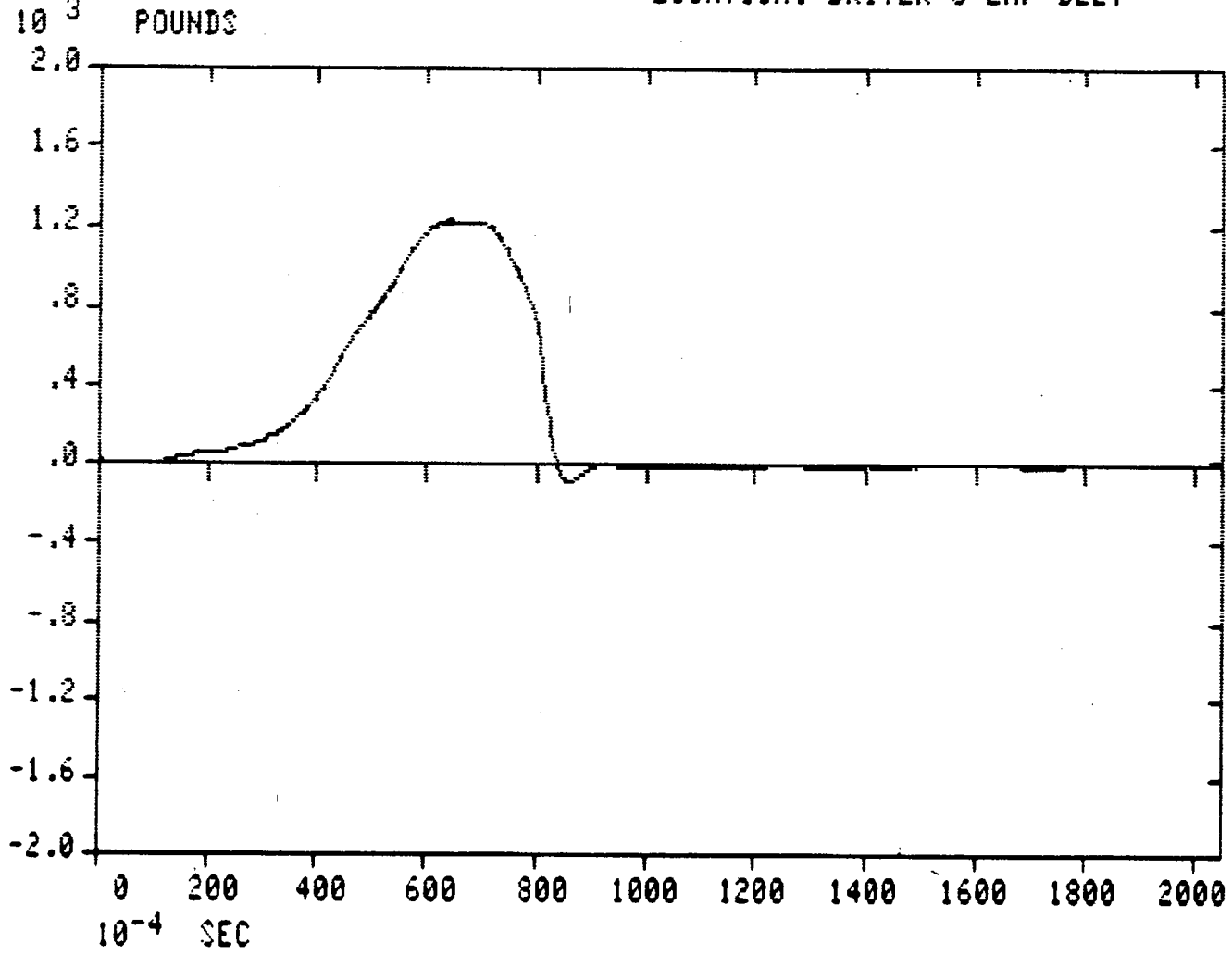


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 60
LOAD CELL: TAPE 1, CH 10
DIRECTION: TENSION
LOCATION: DRIVER'S LAP BELT

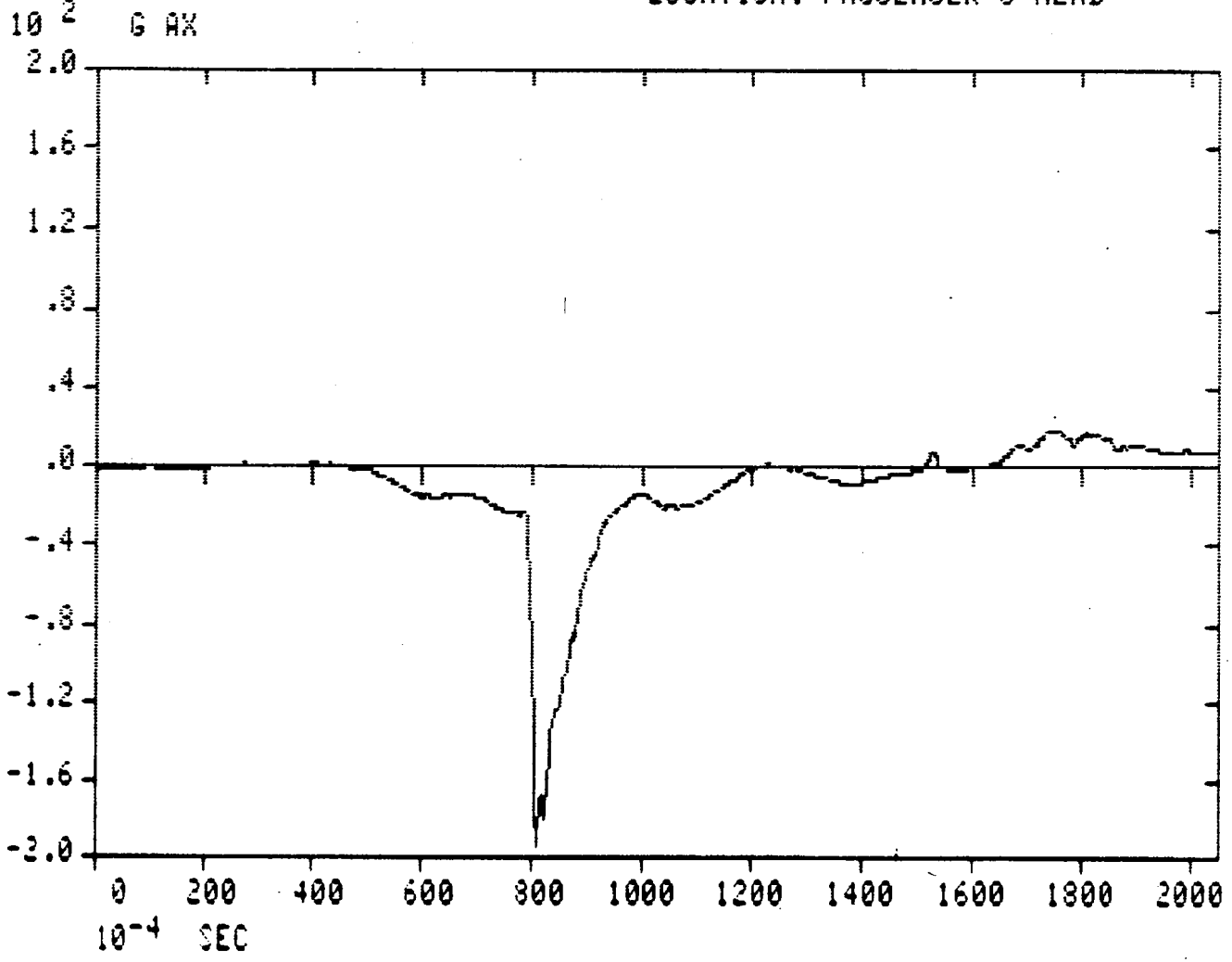


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 871-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 1
DIRECTION: FORWARD
LOCATION: PASSENGER'S HEAD

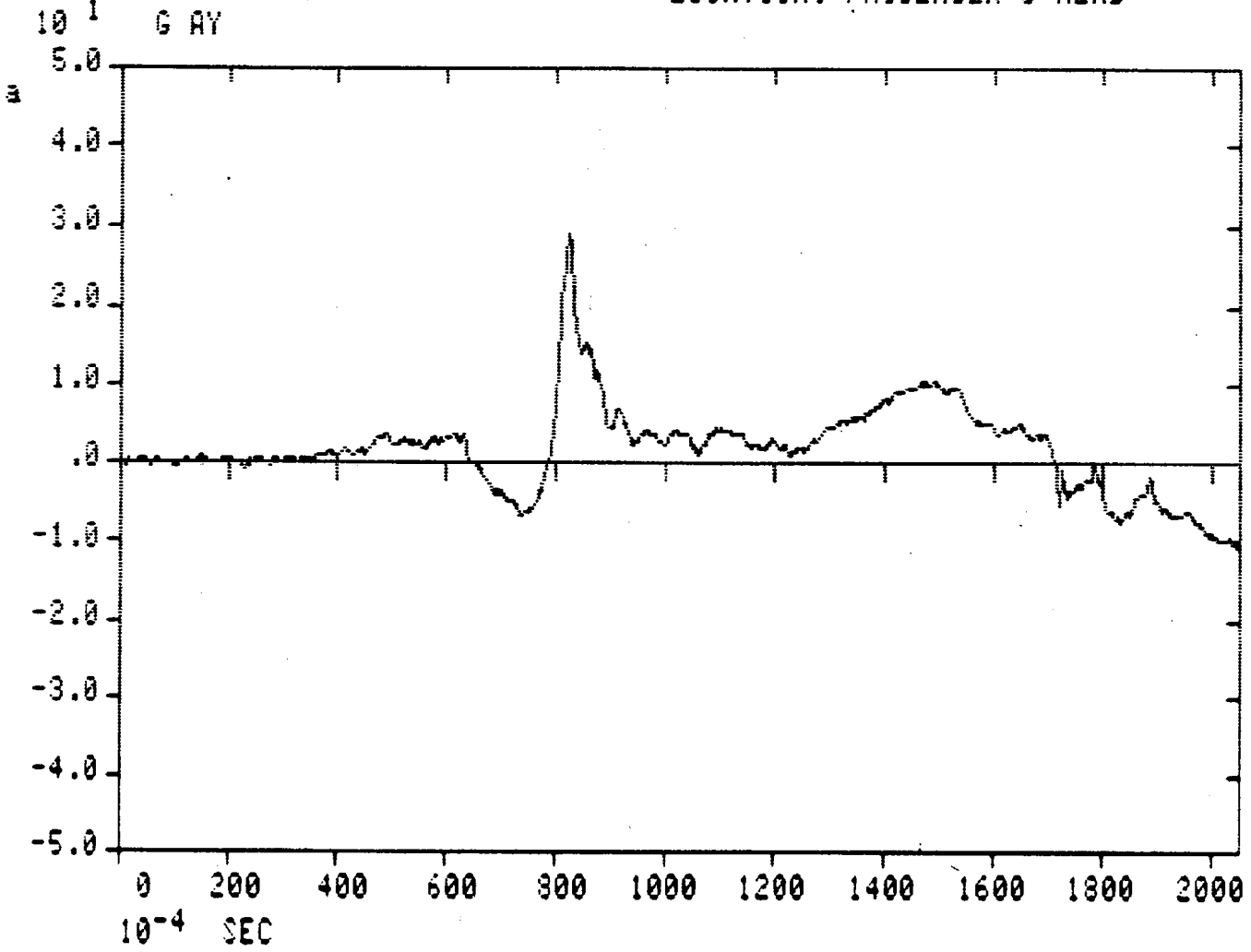


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 2
DIRECTION: LEFT
LOCATION: PASSENGER'S HEAD

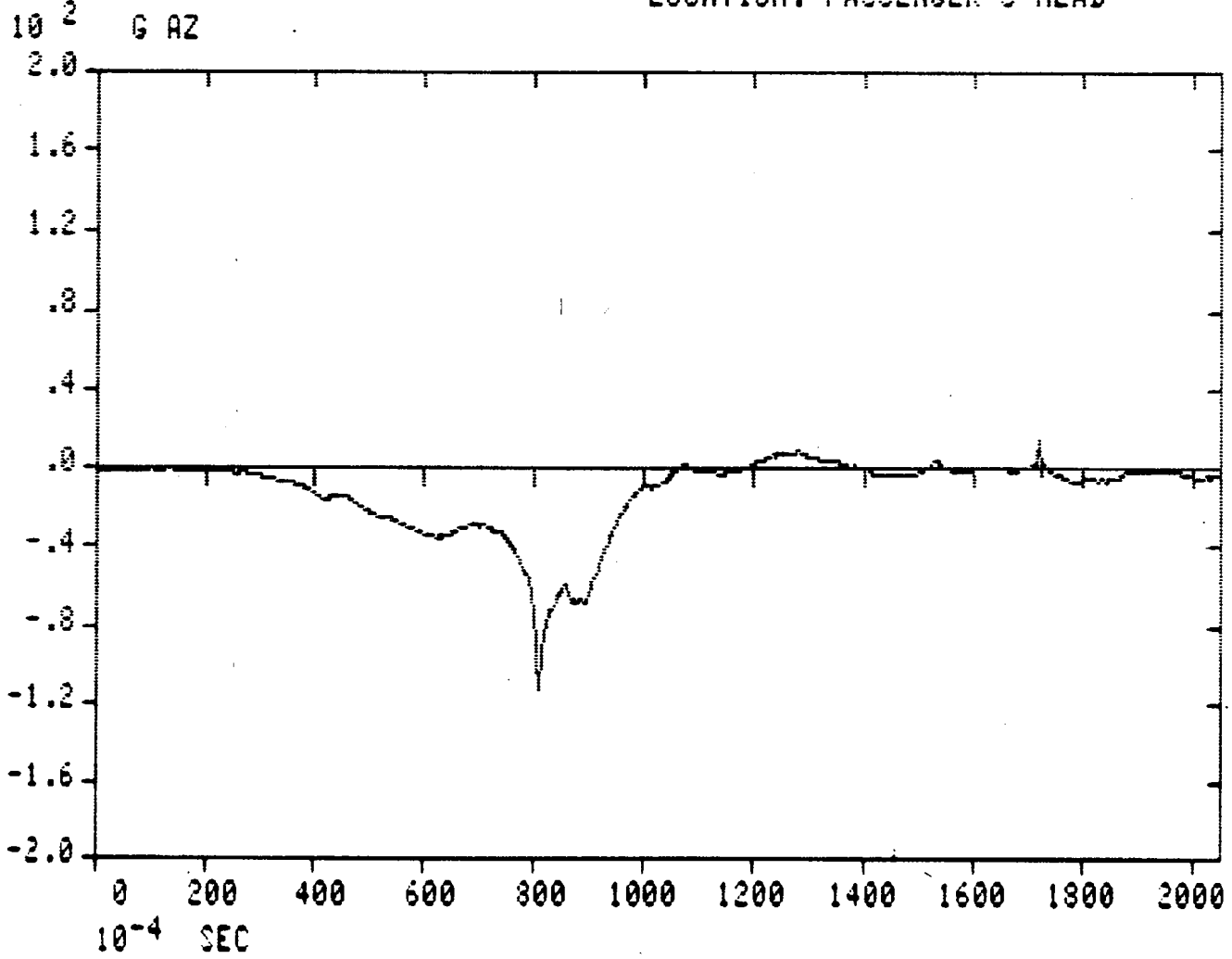


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 3
DIRECTION: UPWARD
LOCATION: PASSENGER'S HEAD

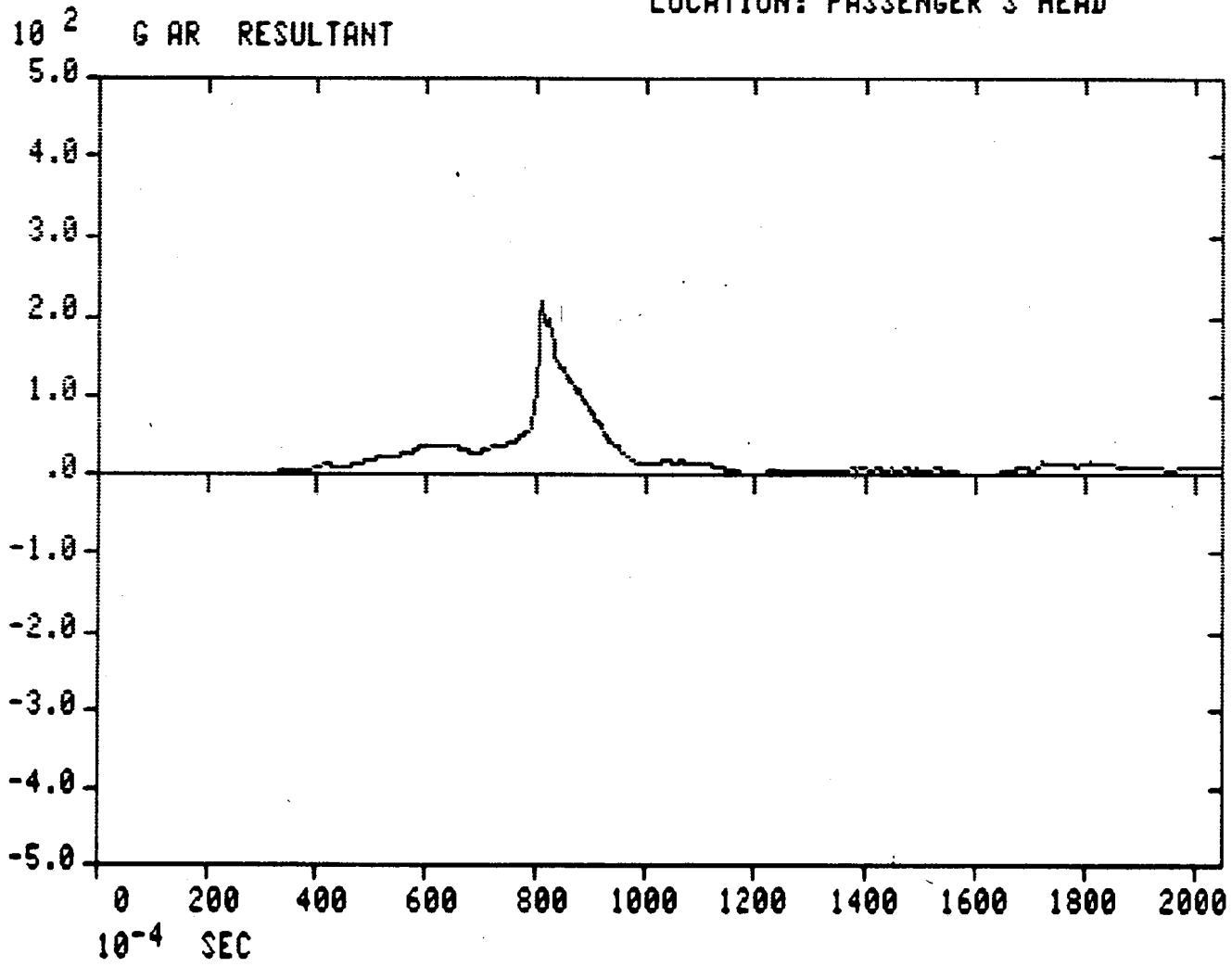


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 1-3
DIRECTION: RESULTANT OF XYZ
LOCATION: PASSENGER'S HEAD

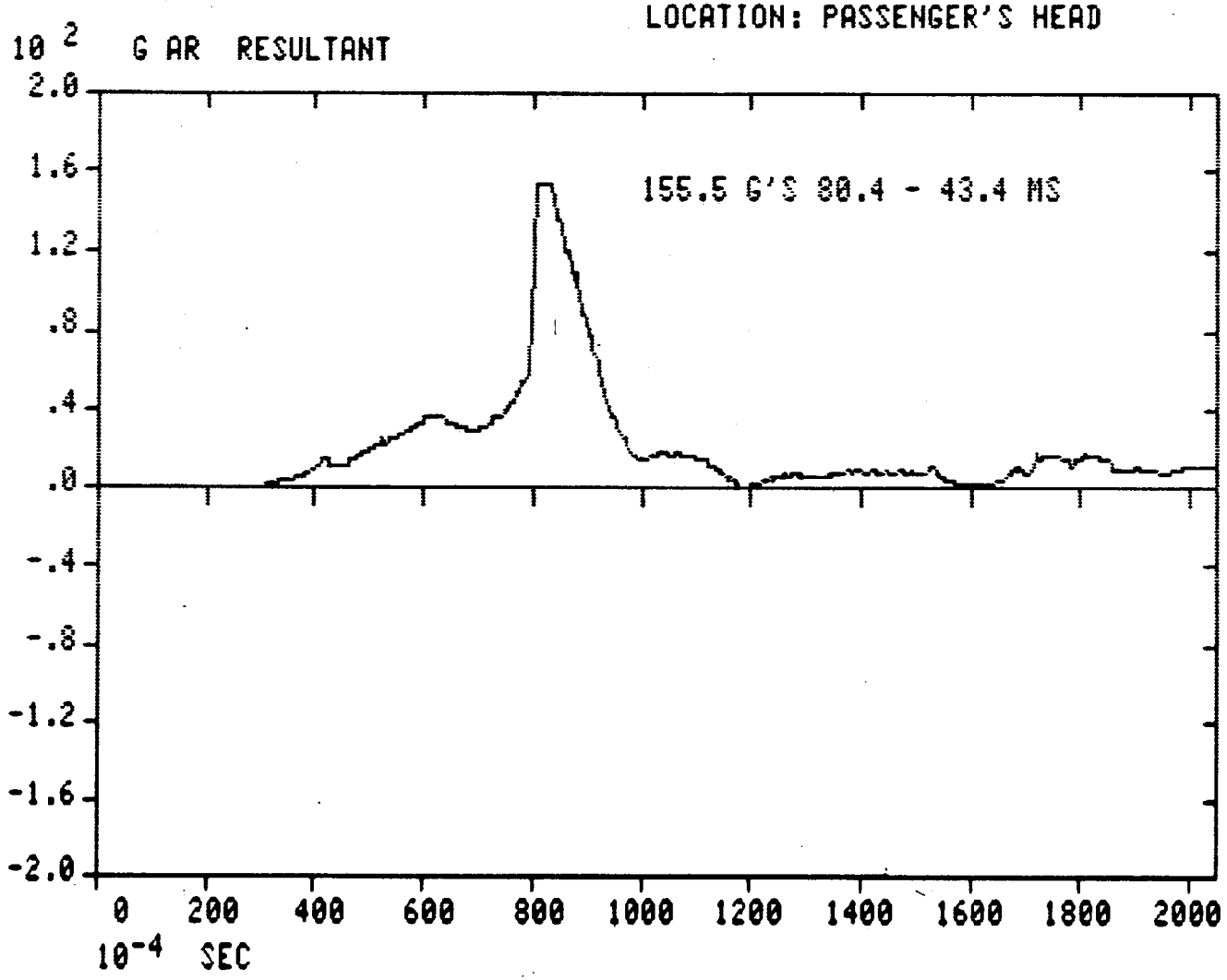


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 1-3
DIRECTION: RESULTANT OF XYZ
LOCATION: PASSENGER'S HEAD

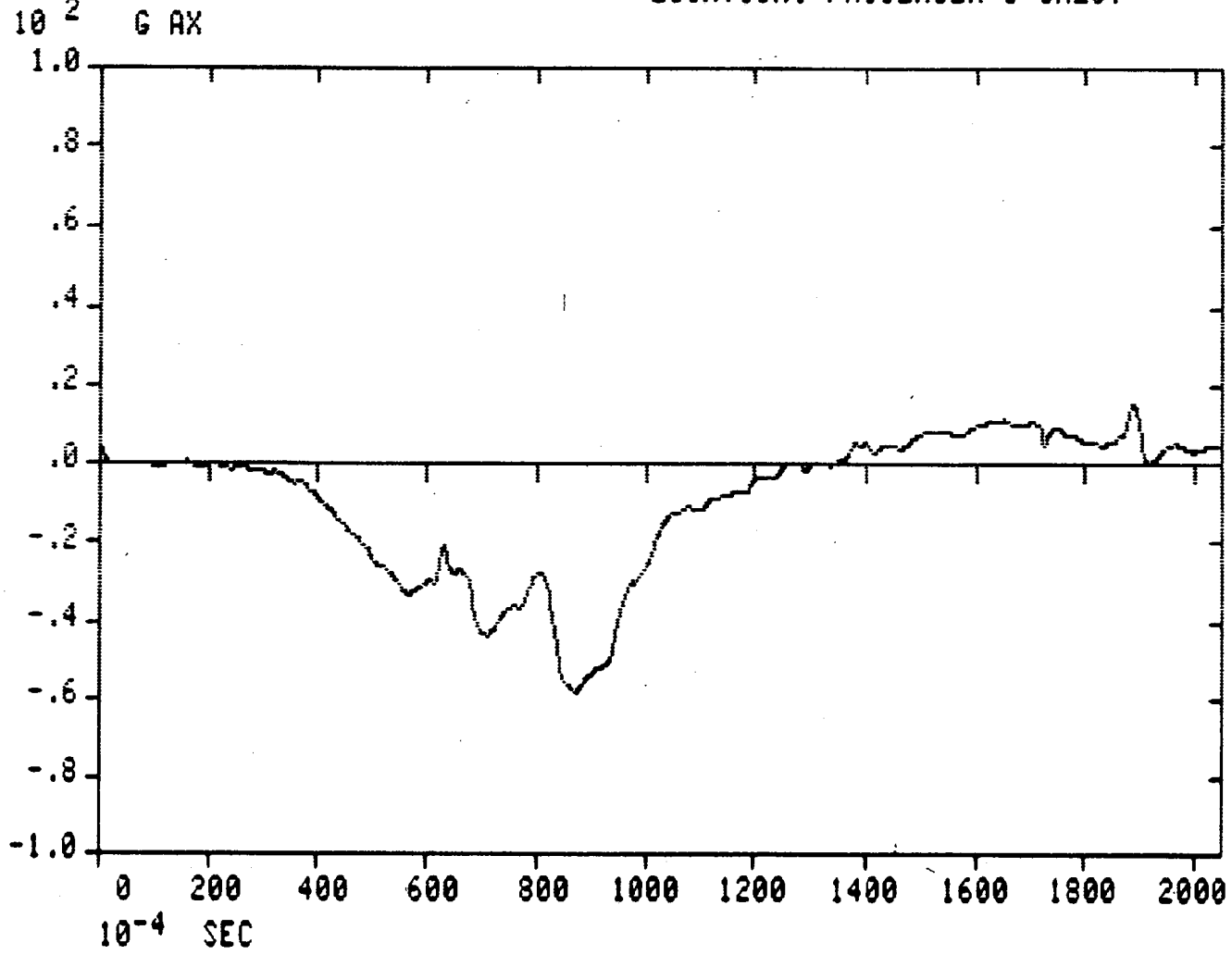


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 2, CH 5
DIRECTION: FORWARD
LOCATION: PASSENGER'S CHEST

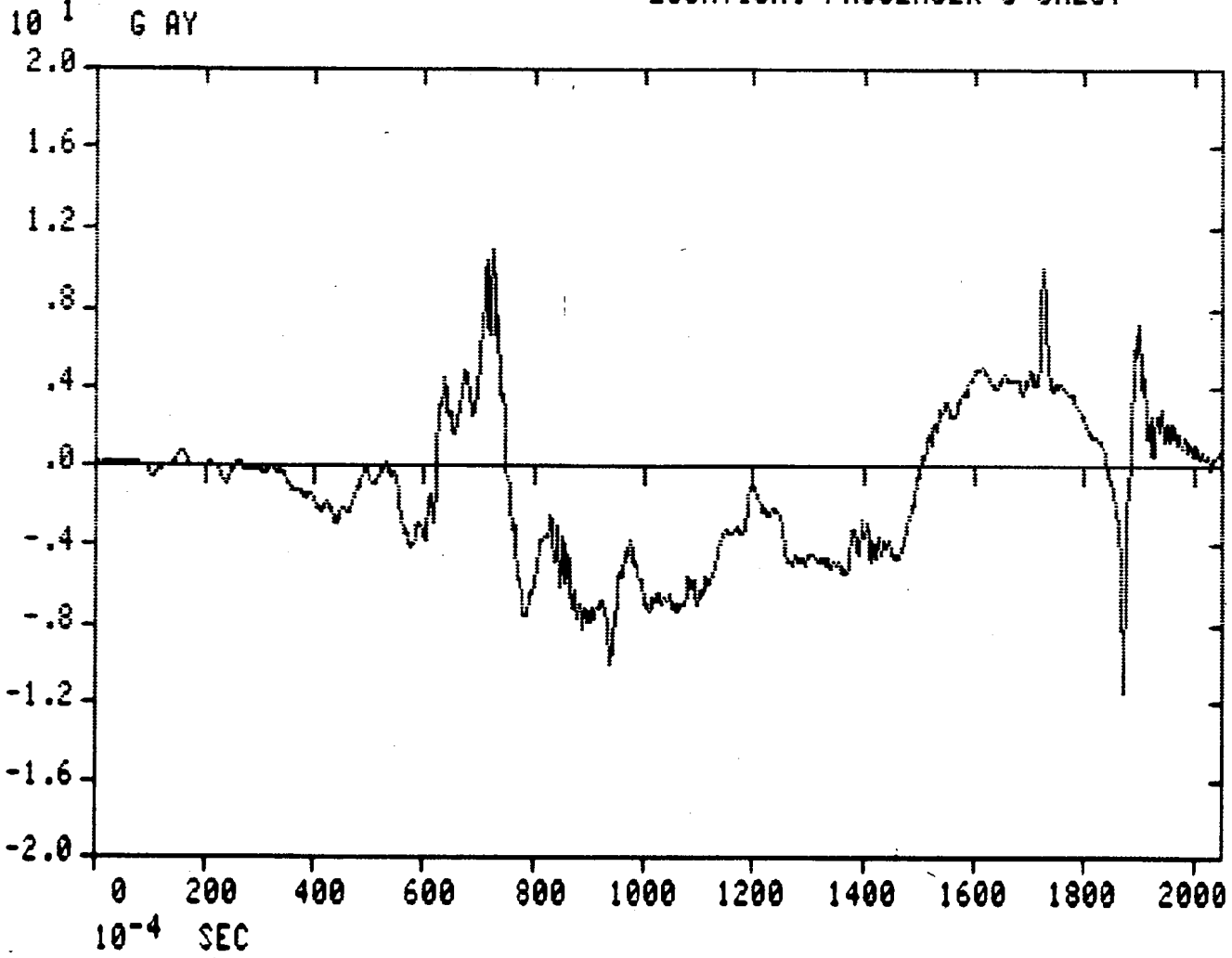


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE: 2, CH 6
DIRECTION: LEFT
LOCATION: PASSENGER'S CHEST

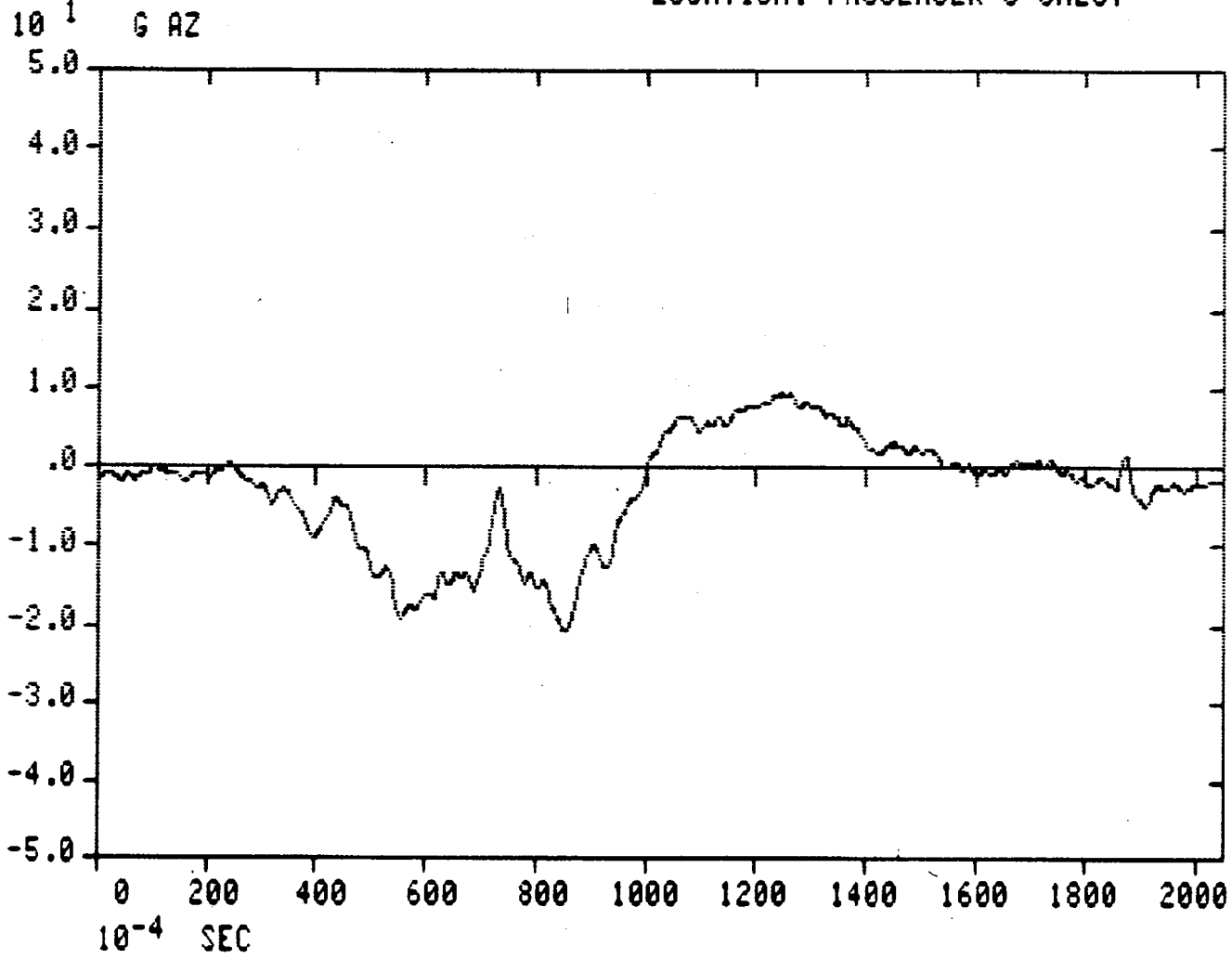


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 2, CH 7
DIRECTION: UPWARD
LOCATION: PASSENGER'S CHEST

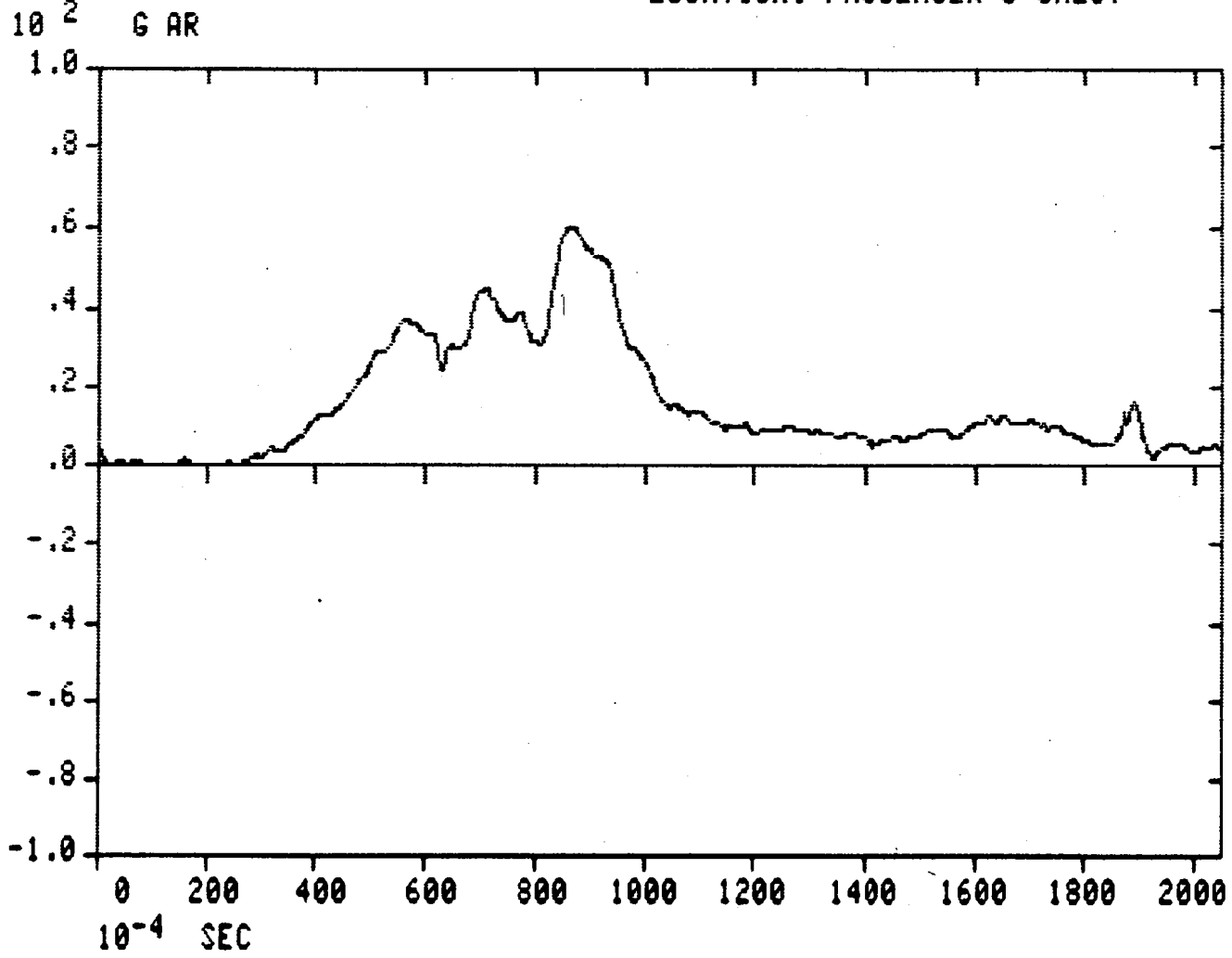


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 5-7
DIRECTION: RESULTANT OF XYZ
LOCATION: PASSENGER'S CHEST

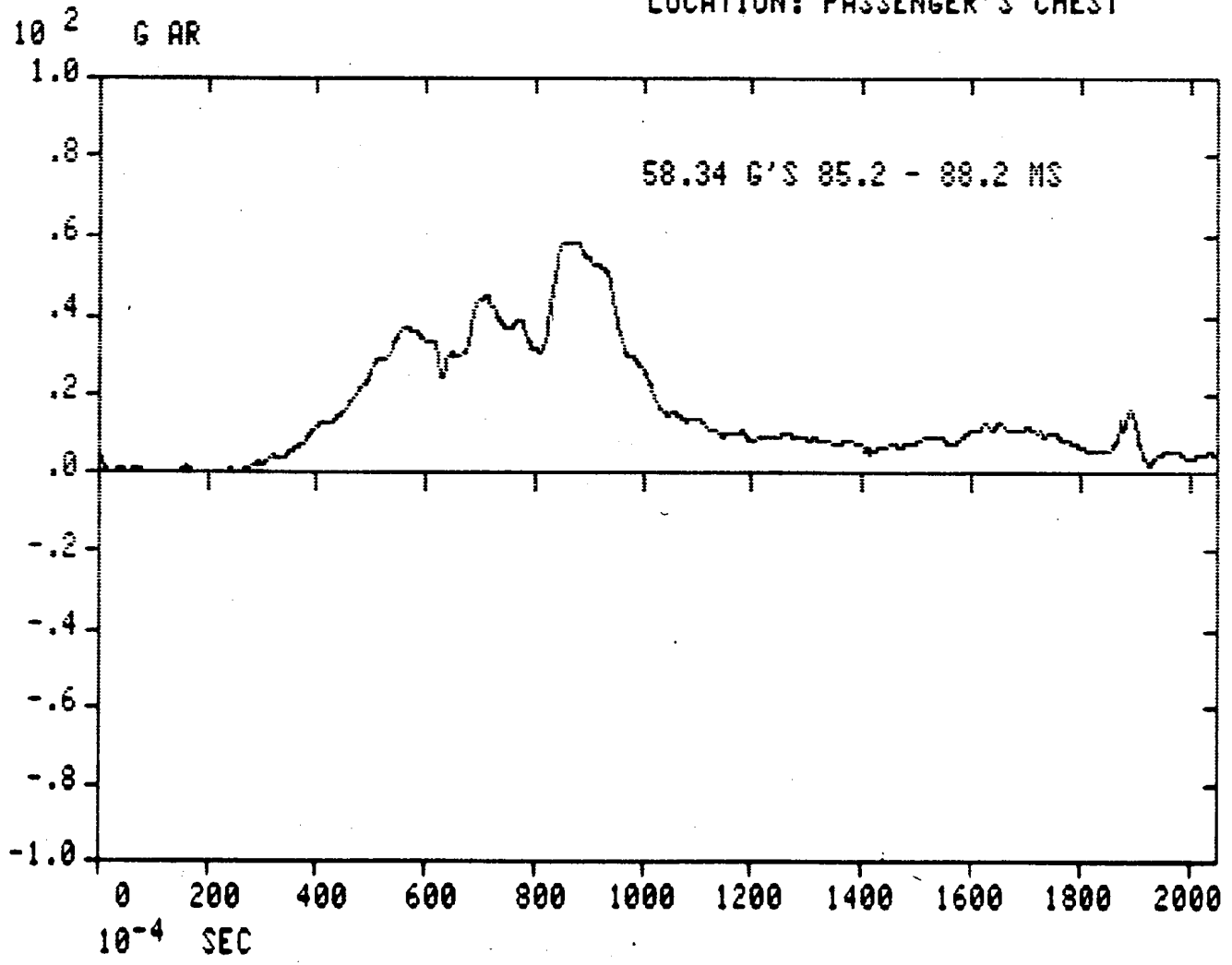


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 5-7
DIRECTION: RESULTANT OF XYZ
LOCATION: PASSENGER'S CHEST

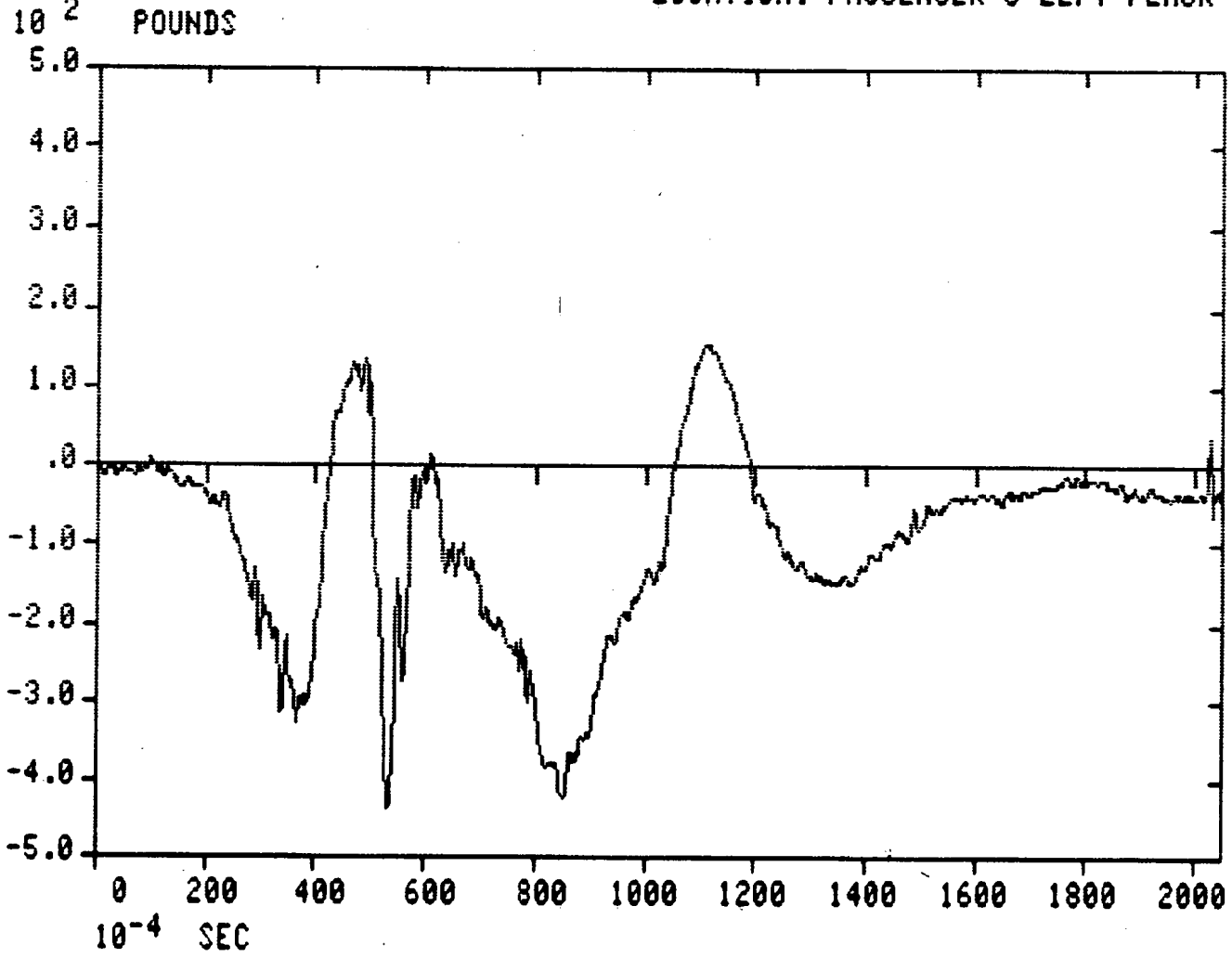


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 600
LOAD CELL: TAPE 2, CH 8
DIRECTION: TENSION
LOCATION: PASSENGER'S LEFT FEMUR

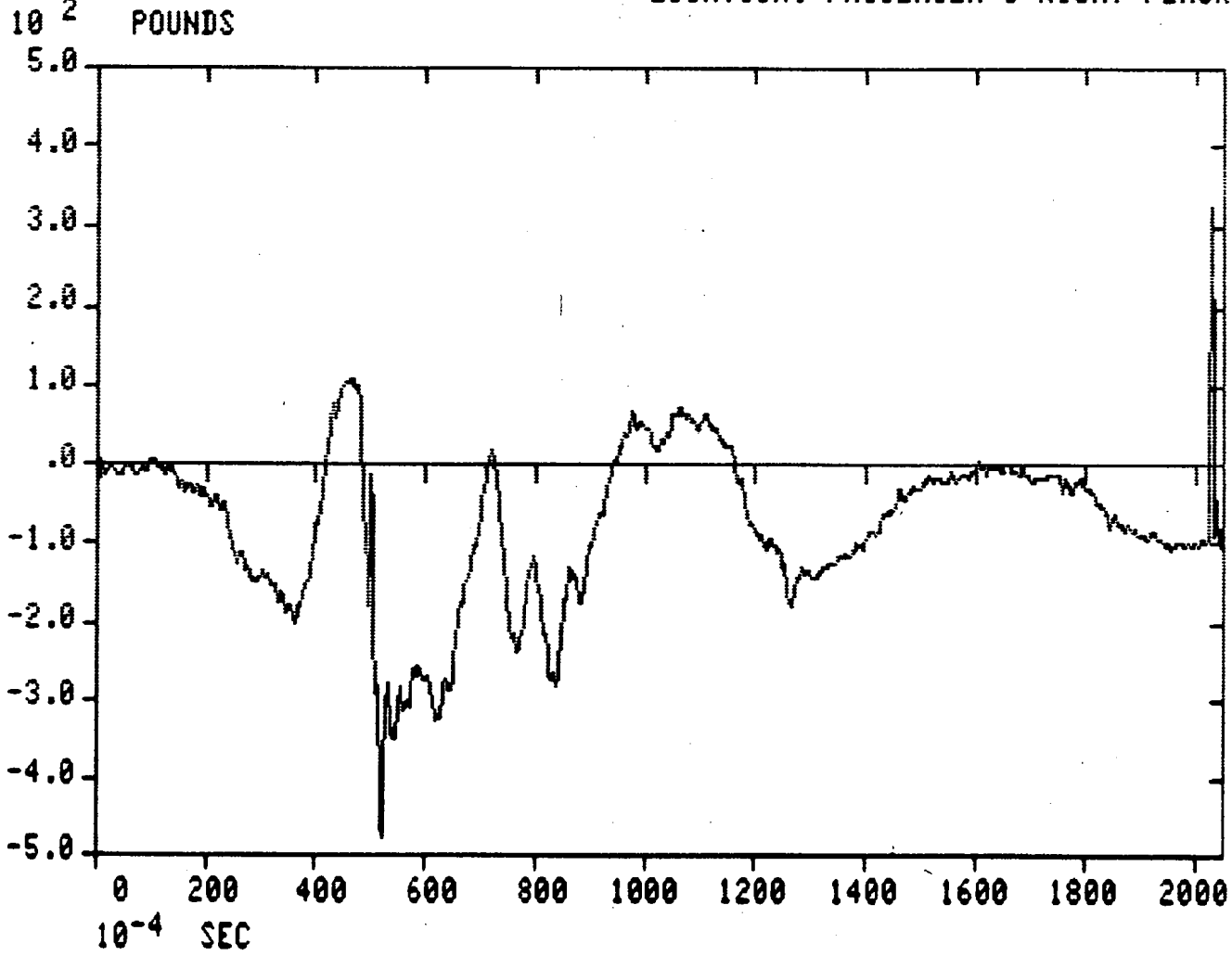


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 600
LOAD CELL; TAPE 2, CH 4
DIRECTION: TENSION
LOCATION: PASSENGER'S RIGHT FEMUR

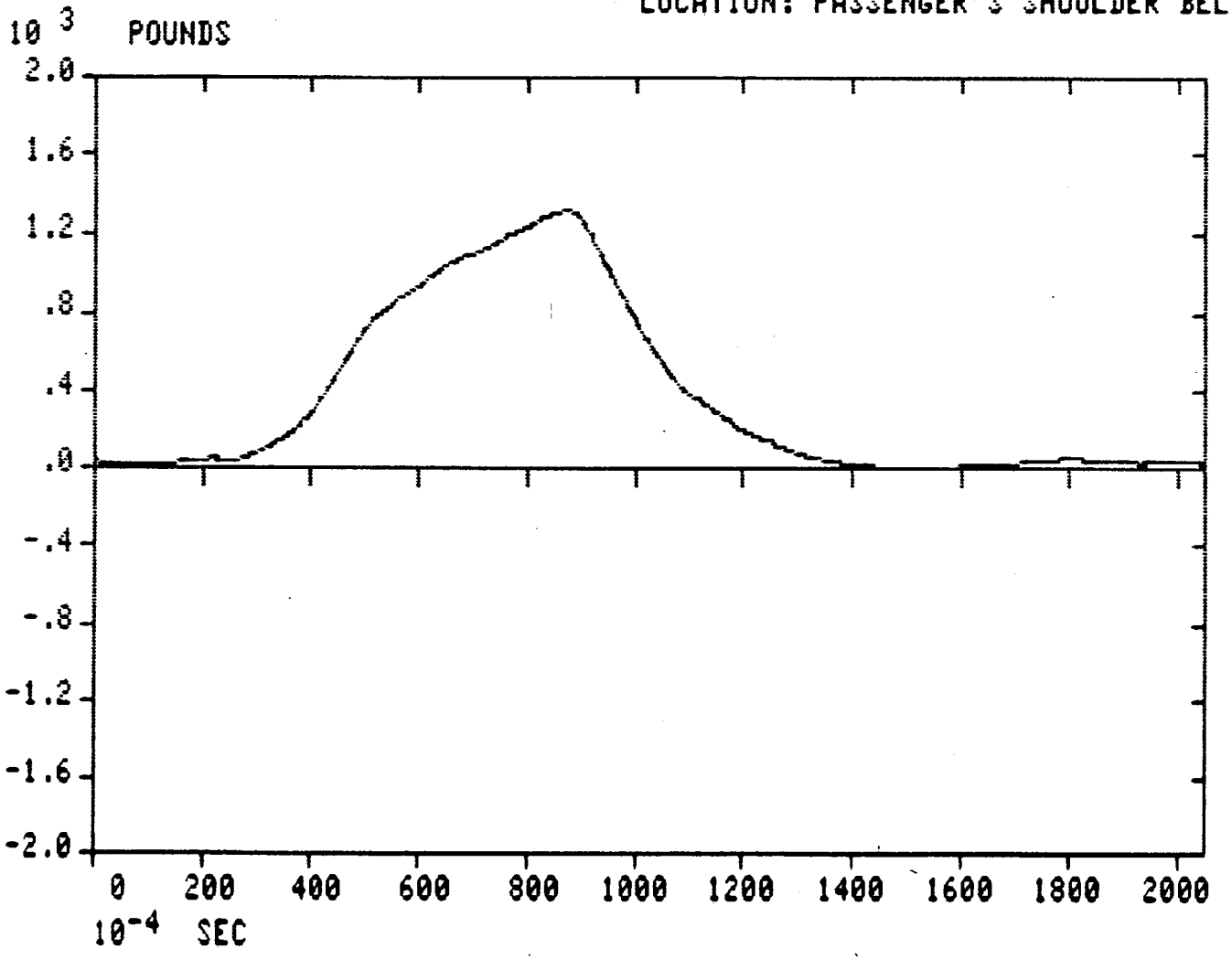


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 60
LOAD CELL: TAPE 2, CH 9
DIRECTION: TENSION
LOCATION: PASSENGER'S SHOULDER BELT

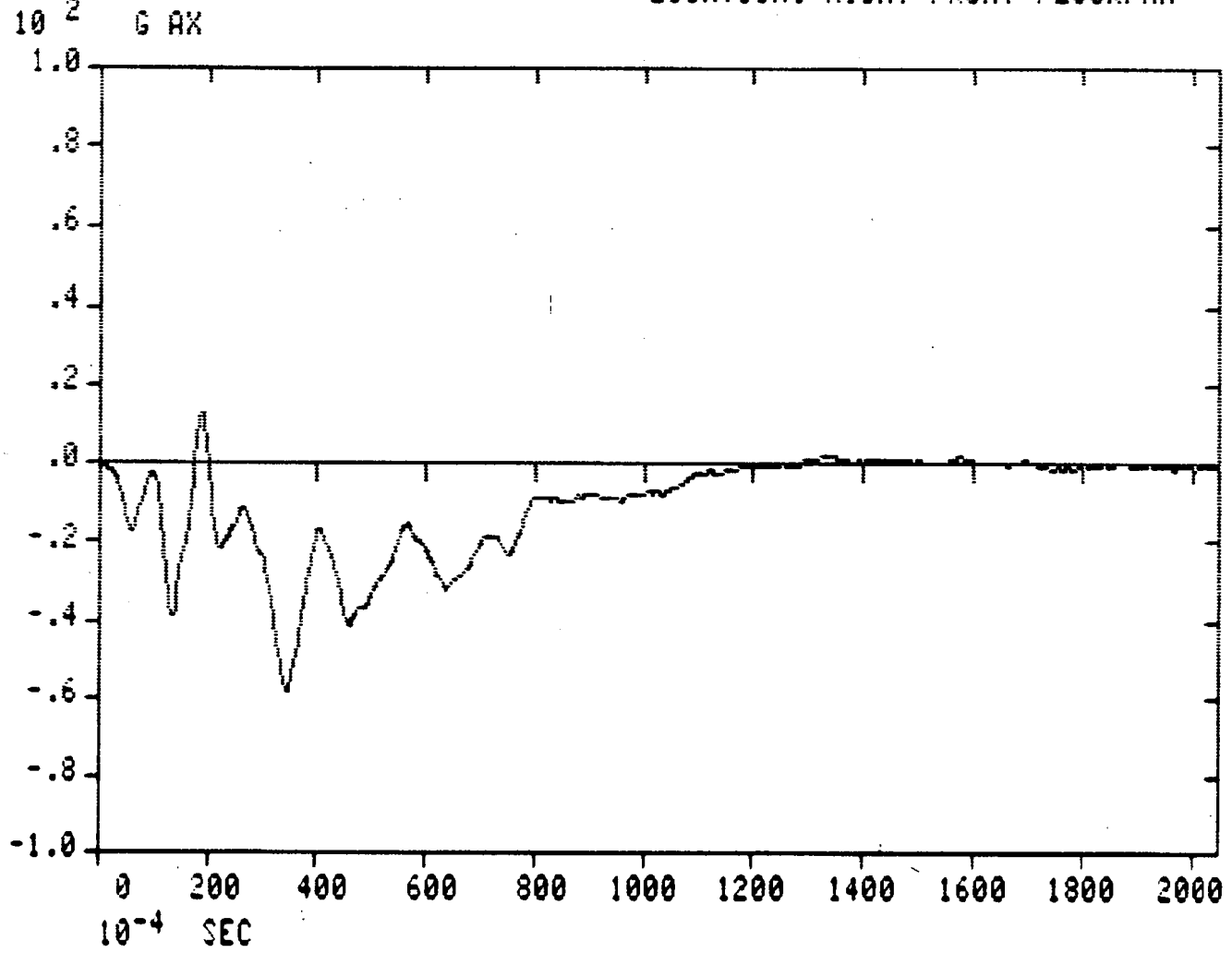


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 60
ACCELEROMETER: TAPE 1, CH 12
DIRECTION: FORWARD
LOCATION: RIGHT FRONT FLOORPAN

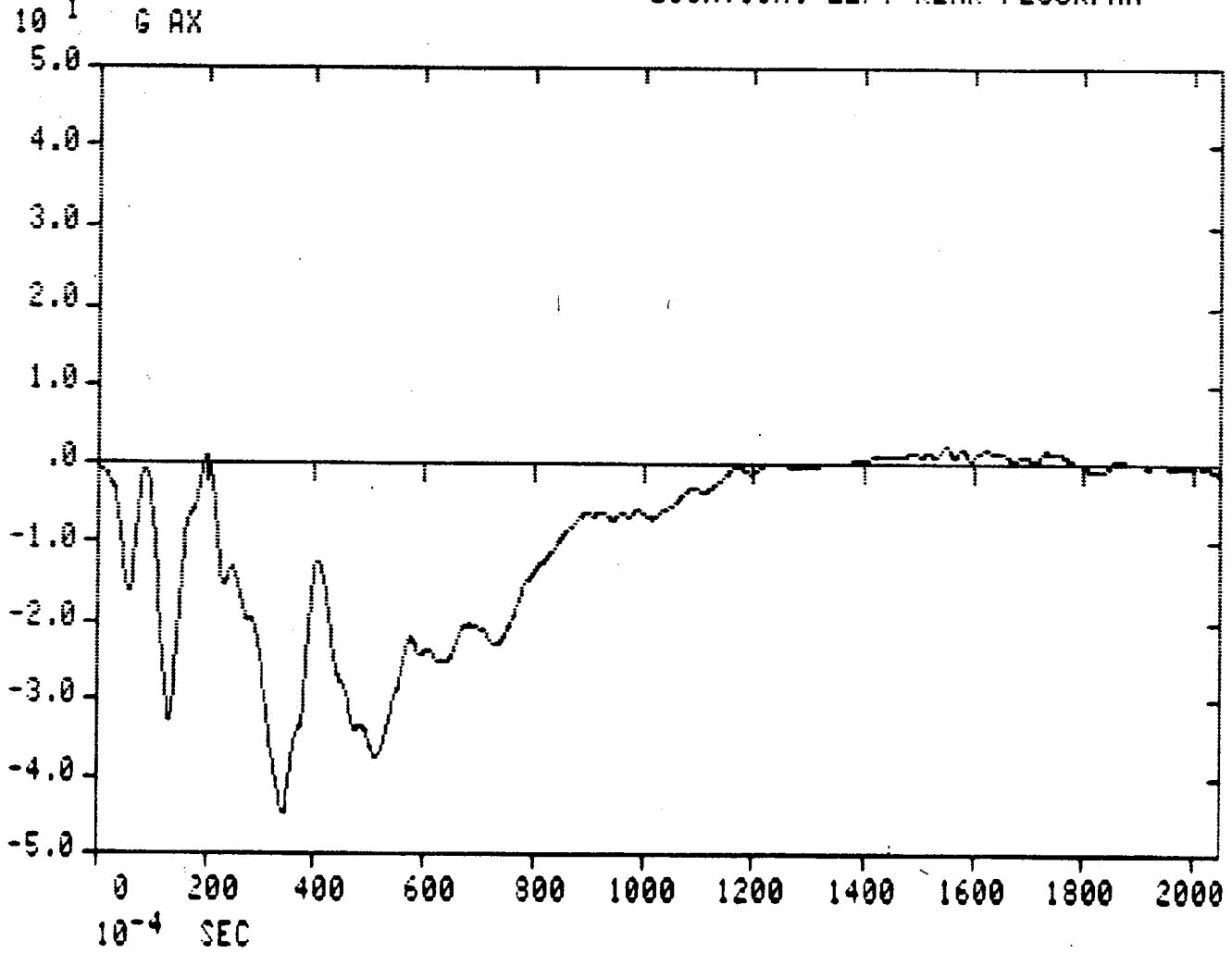


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 60
ACCELEROMETER: TAPE 1, CH 10
DIRECTION: FORWARD
LOCATION: LEFT REAR FLOORPAN

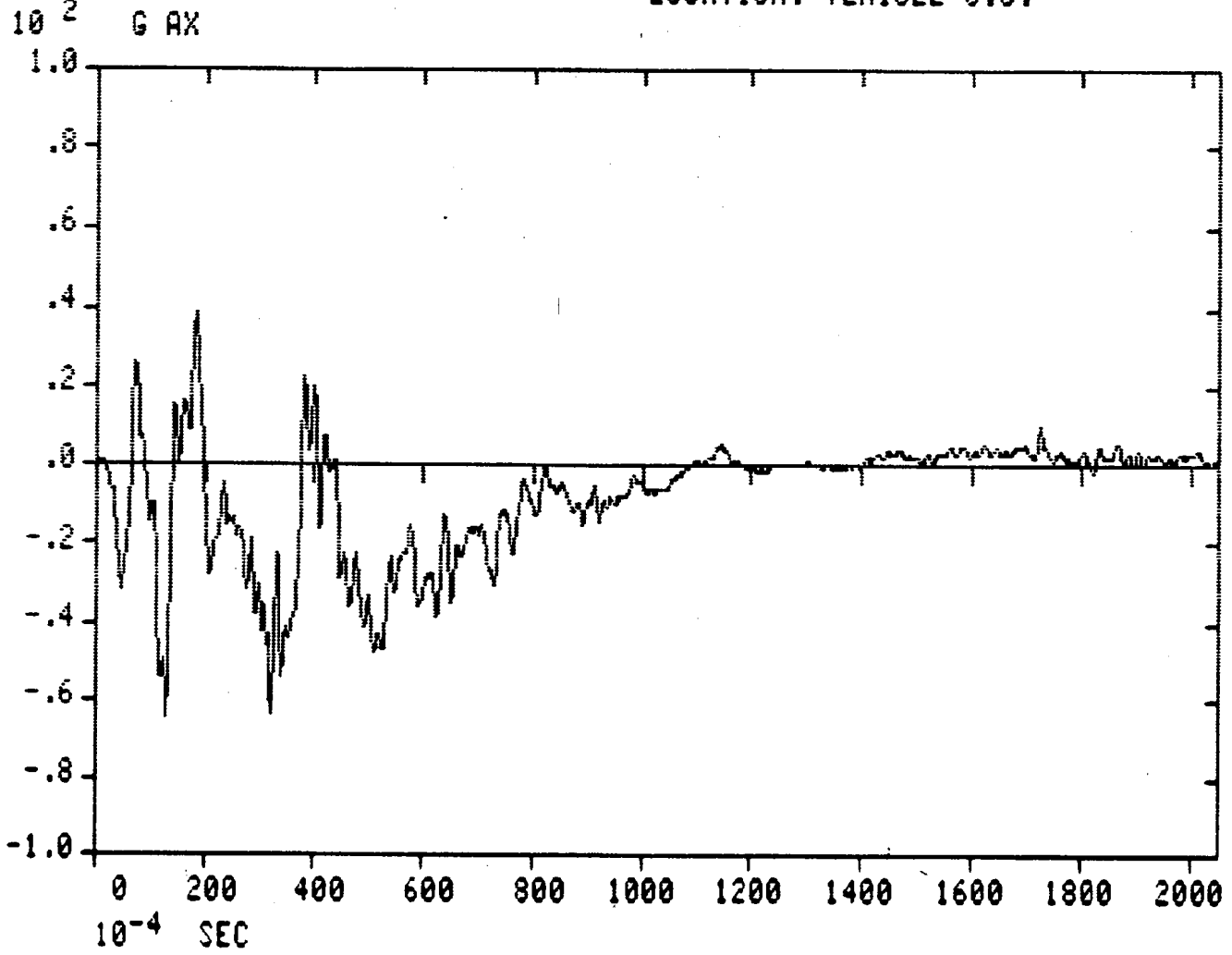


DOT CRASH PROGRAM

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 3, CH 5
DIRECTION: FORWARD
LOCATION: VEHICLE C.G.

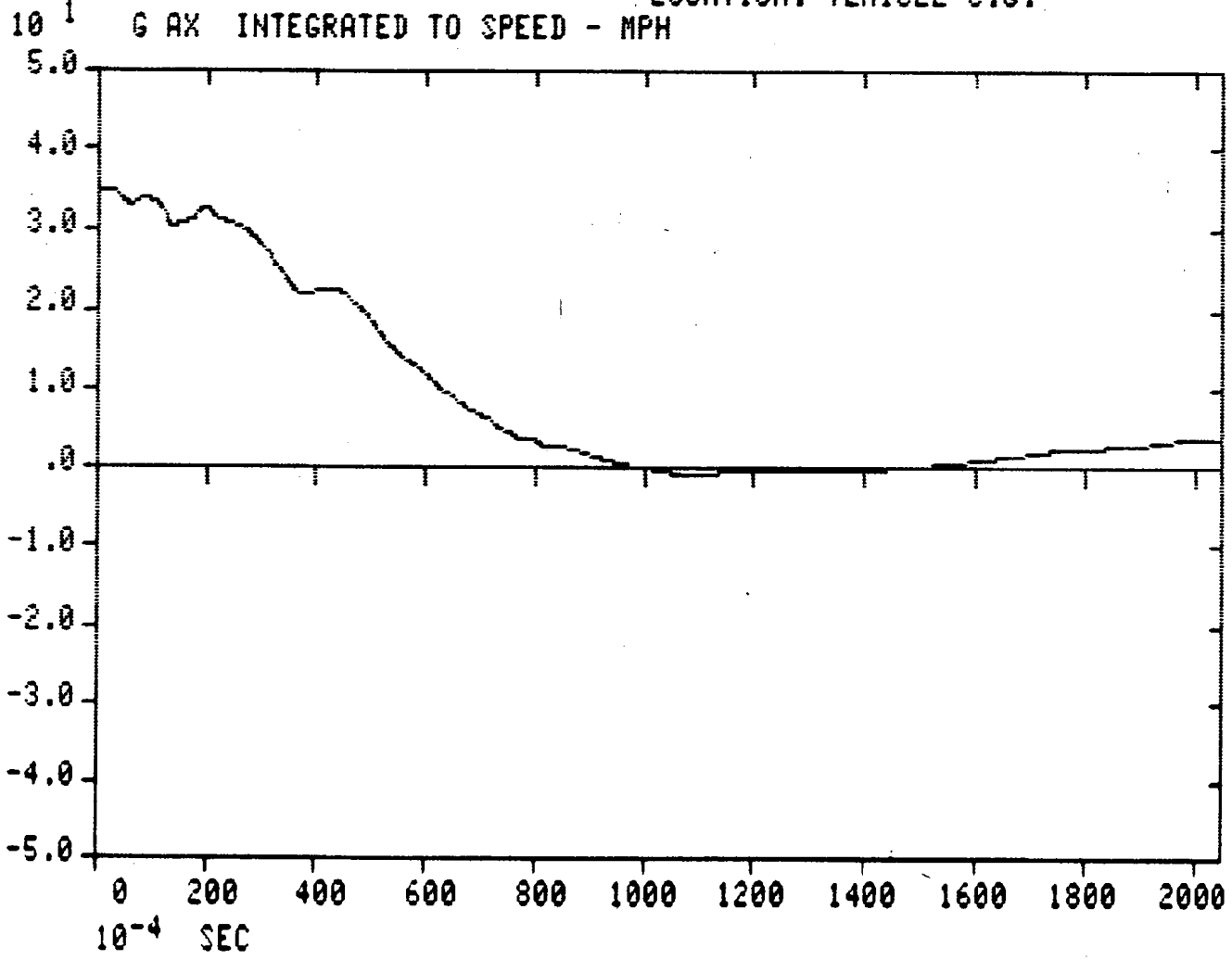


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 3, CH 5
DIRECTION: FORWARD
LOCATION: VEHICLE C.G.

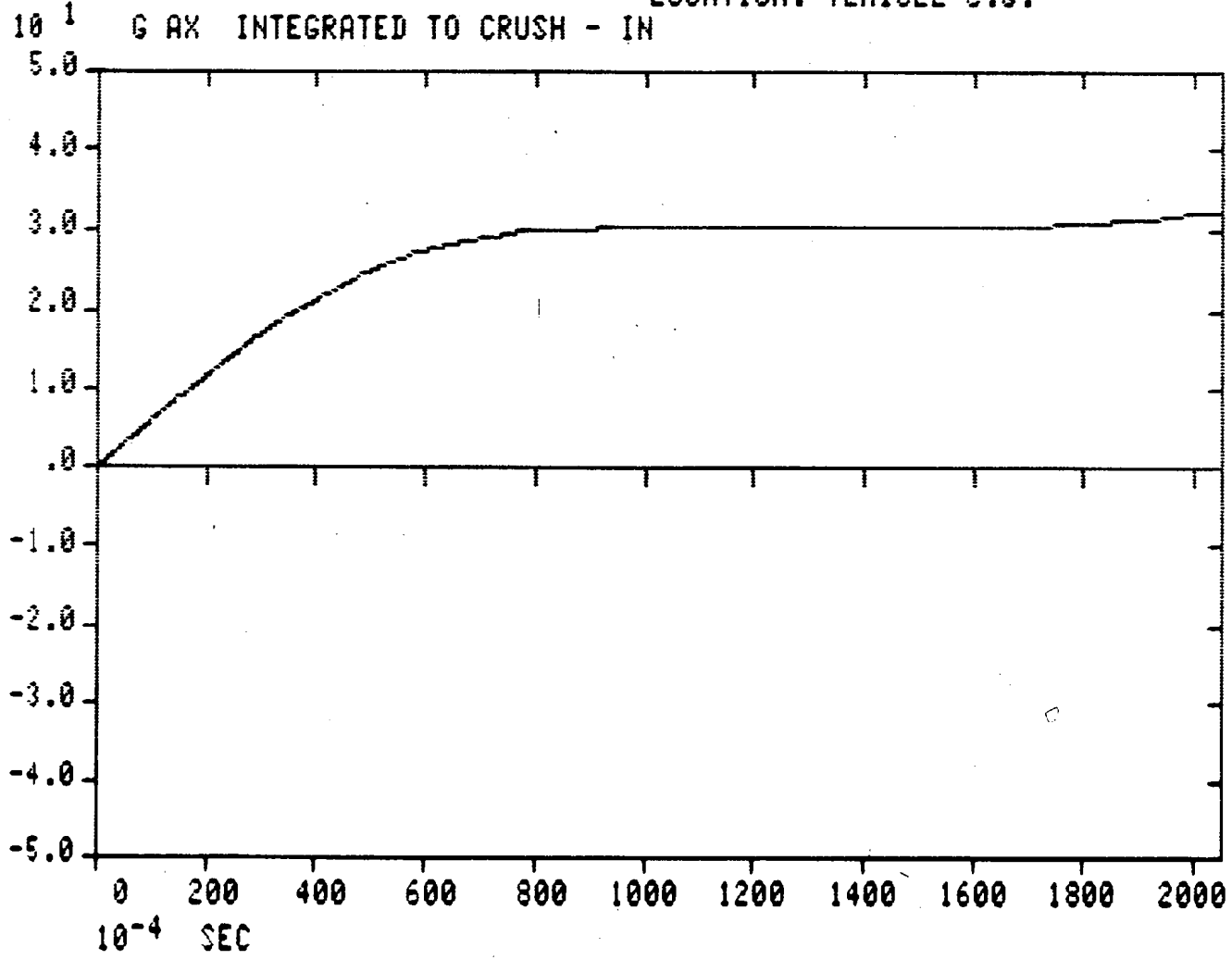


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: SUBARU WAGON
VEHICLE ID: NHTSA 801305
TEST FILE NO. : 85 34.85 MPH
DATE: NOV. 24, 1980 FRONTAL

MJO NO. : 971-3882-26
FILTER: CLASS 180
ACCELEROMETER: TAPE 3, CH 5
DIRECTION: FORWARD
LOCATION: VEHICLE C.G.



APPENDIX C

APPENDIX C

The following report sheets are the Part 572 test dummy calibration test data for the dummies used in the 1980 Subary DL1600 - 4WD - 4 Door Station Wagon, NHTSA 801305 frontal fixed barrier impact.

PART 572 DUMMY CALIBRATION TEST DATA

Dummy S/N 0319

Calibration Laboratory Humanoid Systems

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration		10/31/80	
Calibration Sequential Number for Dummy		13	
Temperature in Lab. (Spec. = 66 to 78°F)		71°F	
Relative Humidity in Lab. (Spec. = 10 to 70%)		67%	
TEST PARAMETER		**SPECIFICATION**	
1. HEAD DROP TEST:			
a. Peak Resultant Accel.		210 to 260G	234.34 g
b. Peak Lateral Accel.		≤ 10G	7.18 g
c. Time above 100G		0.9 to 1.5 ms	1.42 ms
2. NECK BENDING TEST:			
a. Pendulum Speed		21.5 to 25.5 fps	22.0 fps
b. Pendulum Avg. Decel. (over $t_3 - t_2$)		20 to 24G	22.29 g
c. Peak Resultant Head Acceleration		26G maximum	23.5 g
d. Pendulum Decel. (t_2-t_1)		≤ 3 ms	1.94 ms
e. Pendulum Decel. (t_3-t_2)		25 to 30 ms	27.44 ms
f. Pendulum Decel. (t_4-t_3)		≤ 10 ms	3.98 ms
g. Pendulum Direction Reversal Time		≥ 123 ms	128.08 ms
h. Max. Head Rotation		63 to 73°	69.52°
i. Chordal Displacement: Head Rotation Angle			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in.	0 in.
30°	Time	25.6 to 34.4 ms	30.62 ms
	Displ.	2.1 to 3.1 in.	2.83 in.

PART 572 DUMMY CALIBRATION TEST DATA
(Continued)

Dummy S/N 0319

Calibration Laboratory Humanoid Systems

TEST PARAMETER			SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST Continued:					
i. Chordal Displacement: Head Rotation Angle					
	60°	Time	40.3 to 51.7 ms	48.18 ms	
		Displ.	4.3 to 5.3 in.	4.75 in.	
	Maximum (°)	Time	53.2 to 66.8 ms	61.65 ms	
		Displ.	5.0 to 6.0 in.	5.37 in,	
	60°	Time	67.0 to 83.0 ms	75.07 ms	
		Displ.	4.3 to 5.3 in.	4.51 in.	
	30°	Time	85.4 to 104.6 ms	100.62 ms	
		Displ.	2.1 to 3.1 in.	2.36 in.	
	0°	Time	101.0 to 123.0 ms	117.07 ms	
		Displ.	-.5 to 0.5 in.	-0.18 in.	
3. ABDOMINAL COMPRESSION TEST: (Preload = 10 pounds)					
a. Force @ .5"			13 to 37 lbs.	29.5 lbs.	
b. Force @ .75"			37 to 50 lbs.	43.5 lbs.	
c. Force @ 1.0"			50 to 63 lbs.	58.0 lbs.	
d. Force @ 1.3"			73 to 88 lbs.	82.5 lbs.	
4.. LUMBAR FLEXION TEST:					
a. Force @ 20°			22 to 34 lbs.	29.0 lbs.	
b. Force @ 30°			34 to 46 lbs.	44.5 lbs.	
c. Force @ 40°			46 to 58 lbs.	51.0 lbs.	
d. Return Angle			12° maximum	8.0°	

PART 572 DUMMY CALIBRATION TEST DATA
(Continued)

Dummy S/N 0319

Calibration Laboratory Humanoid Systems

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed	21.78-22.22 fps	22.0 fps	
(2) Peak Deflection	1.7" maximum	1.48 in.	
(3) Peak Resistive Force	2250 lbs. max.	2124.80 lbs.	
(4) Internal Hysteresis	50 to 70%	60.78%	
b. Low Speed			
(1) Probe Speed	13.86-14.14 fps	14.0 fps	
(2) Peak Deflection	1.1" maximum	0.98 in.	
(3) Peak Resistive Force	1450 lbs. max.	1329.60 lbs.	
(4) Internal Hysteresis	50 to 70%	55.48%	
6. KNEE IMPACT TESTS:			
a. Right Side			
(1) Probe Side	6.76 to 7.04 fps	6.90 fps	
(2) Maximum Force	1850 to 2500 lbs.	2306.12 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.79 ms	
b. Left Side			
(1) Probe Speed	6.76 to 7.04 fps	6.90 fps	
(2) Maximum Force	1850 to 2500 lbs.	2249.54 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.79 ms	

PART 572 DUMMY CALIBRATION TEST DATA

Dummy S/N 0358

Calibration Laboratory Dynamic Science (Pre)
Humanoid Systems (Post)

			Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration			10/10/80	
Calibration Sequential Number for Dummy			3	
Temperature in Lab. (Spec. = 66 to 78°F)			75°F	
Relative Humidity in Lab. (Spec. = 10 to 70%)			55%	
TEST PARAMETER		**SPECIFICATION**		
1. HEAD DROP TEST:				
a. Peak Resultant Accel.		210 to 260G	234.4 g	
b. Peak Lateral Accel.		≤ 10G	10.0 g	
c. Time above 100G		0.9 to 1.5 ms	1.0 ms	
2. NECK BENDING TEST:				
a. Pendulum Speed		21.5 to 25.5 fps	21.9 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$)		20 to 24G	23.0 g	
c. Peak Resultant Head Acceleration		26G maximum	20.71 g	
d. Pendulum Decel. (t_2-t_1)		≤ 3 ms	2.0 ms	
e. Pendulum Decel. (t_3-t_2)		25 to 30 ms	27.0 ms	
f. Pendulum Decel. (t_4-t_3)		≤ 10 ms	4.0 ms	
g. Pendulum Direction Reversal Time		≥ 123 ms	N/A	
h. Max. Head Rotation		63 to 73°	64.81°	
i. Chordal Displacement: Head Rotation Angle				
0°	Time	-2 to 2 ms	0 ms	
	Displ.	-.5 to .5 in.	0 in.	
30°	Time	25.6 to 34.4 ms	27.7 ms	
	Displ.	2.1 to 3.1 in.	2.78 in.	

PART 572 DUMMY CALIBRATION TEST DATA
(Continued)

Dummy S/N 0358

Calibration Laboratory Dynamic Science (Pre)
Humanoid Systems (Post)

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST Continued: i. Chordal Displacement: Head Rotation Angle				
60°	Time	40.3 to 51.7 ms	48.0 ms	
	Displ.	4.3 to 5.3 in.	5.40 in.	
Maximum (°)	Time	53.2 to 66.8 ms	55.0 ms	
	Displ.	5.0 to 6.0 in.	5.66 in.	
60°	Time	67.0 to 83.0 ms	64.0 ms	
	Displ.	4.3 to 5.3 in.	5.39 in.	
30°	Time	85.4 to 104.6 ms	86.0 ms	
	Displ.	2.1 to 3.1 in.	2.77 in.	
0°	Time	101.0 to 123.0 ms	106.0 ms	
	Displ.	-.5 to 0.5 in.	-0.079 in.	
3. ABDOMINAL COMPRESSION TEST: (Preload = 10 pounds)				
a. Force @ .5"		14 to 26 lbs.	21.99 lbs.	
b. Force @ .75"		27 to 40 lbs.	34.73 lbs.	
c. Force @ 1.0"		40 to 53 lbs.	49.77 lbs.	
d. Force @ 1.3"		63 to 78 lbs.	75.24 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20°		22 to 34 lbs.	32.99 lbs.	
b. Force @ 30°		34 to 46 lbs.	43.99 lbs.	
c. Force @ 40°		46 to 58 lbs.	49.20 lbs.	
d. Return Angle		12° maximum	6.37°	

PART 572 DUMMY CALIBRATION TEST DATA
(Continued)

Dummy S/N 0358

Calibration Laboratory Dynamic Science (Pre)
Humanoid Systems (Post)

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed	21.78-22.22 fps	22.0 fps	
(2) Peak Deflection	1.7" maximum	1.5 in.	
(3) Peak Resistive Force	2250 lbs. max.	2203.0 lbs.	
(4) Internal Hysteresis	50 to 70%	57.1%	
b. Low Speed			
(1) Probe Speed	13.86-14.14 fps	13.94 fps	
(2) Peak Deflection	1.1" maximum	0.97 in.	
(3) Peak Resistive Force	1450 lbs. max.	1348.0 lbs.	
(4) Internal Hysteresis	50 to 70%	56.5%	
6. KNEE IMPACT TESTS:			
a. Right Side			
(1) Probe Side	6.76 to 7.04 fps	6.88 fps	
(2) Maximum Force	1850 to 2500 lbs.	1942.0 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.20 ms	
b. Left Side			
(1) Probe Speed	6.76 to 7.04 fps	6.87 fps	
(2) Maximum Force	1850 to 2500 lbs.	2410.0 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.75 ms	

APPROVED ENGINEERING TEST LABORATORIES

SERVICE FOR: U. S. Department of Transportation
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
400 Seventh Street S. W.
Washington, D. C. 20590

CONTRACT NUMBER: DOT-HS-9-02273

I hereby certify that the preceding report is true and correct to the best of my knowledge.

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rmh